THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1942.] LONDON, JULY 31, 1900. [52ND YEAR. PRICE 6d.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

For Prices, o.b. Ship or Delivered by Rail, apply to
The Wallsend & Hebburn Coal Company, Ltd.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

CARSON'S PAINTS
THE ORIGINAL
ANTI-CORROSION.
Sent out in Dry Powder with Oils for mixing separate.
Is the most Durable Paint for all
EXPOSED IRON AND WOOD WORK.

FERRI-SILICON,
A PAINT MIXED READY FOR USE,
IS ALSO RECOMMENDED FOR USE ON
GASHOLDERS.
Price from 4s. 3d. per Gallon.
Special Quotations for Quantities.
LISTS WITH PATTERNS, 60 COLOURS, FREE.

WALTER CARSON & SONS,
GROVE WORKS, BATTERSEA, LONDON.

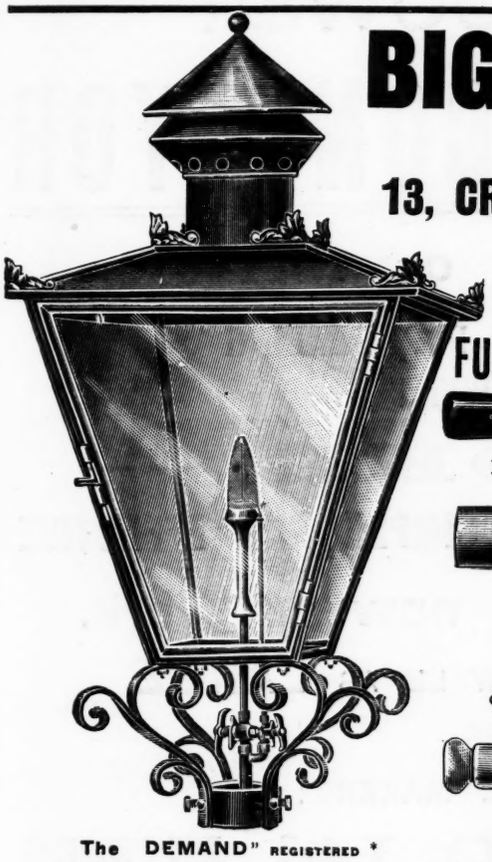
— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT.
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
81, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

Wrought-Iron

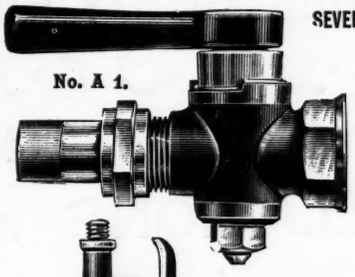
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH


The DEMAND" REGISTERED *

BIGGS, WALL, & CO.,
GAS AND WATER ENGINEERS,
13, CROSS STREET, FINSBURY PAVEMENT,
LONDON, E.C.

WRITE FOR OUR **PRICE LISTS** OF
FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.

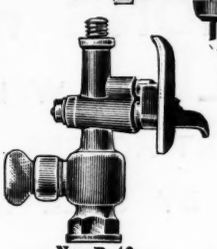

No. A 1.

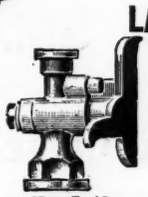
THESE TAPS ARE
FULL-WAY
AS SHOWN.

No. A.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.


No. B 10.

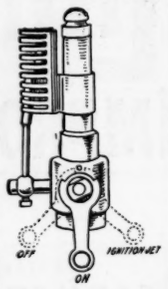

No. A 13.

No. A 12.

No. A 1

*Specially constructed for New Incandescent Burner.

For Ordinary Burner.



Price 2s. 6d. complete.

THE MACHEBACH GAS-LIGHTERS.

ECONOMY, SAFETY, SIMPLICITY.

NO MATCHES, TAPERS, ETC., REQUIRED.

SAVES GAS.

Full Particulars of Prices and other Forms of Self-Lighters on application to the

MATCHLESS GAS LIGHTING SYNDICATE, LTD.,
130, Queen Victoria Street, LONDON, E.C.

For Incandescent Burner.

Price 3s. each, without Burner or Mantle.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER, LONDON."

ASTON TUBE WORKS, LTD.,
BIRMINGHAM.
Telegrams: "PLUME." London: "DEPLUME."
London Office:
146, DASHWOOD HOUSE, 9, NEW BROAD ST., E.C.
MANUFACTURERS OF ALL KINDS OF
WROUGHT-IRON TUBES AND FITTINGS.

THE "DE BROUWER"
PATENT COKE-CONVEYOR

FOR ELEVATING AND CONVEYING.

SUPERSEDES ALL OTHERS FOR DEALING AUTOMATICALLY WITH

— HOT COKE. —

DOES NOT BREAK THE COKE. SIMPLE AND EFFECTIVE.

25 INSTALLATIONS now at Work.

SUITABLE FOR **SMALL** AS WELL AS **LARGE**
RETORT-HOUSES.

GUARANTEED BY SOLE MAKERS:

W. J. JENKINS & CO., Ltd., RETFORD.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

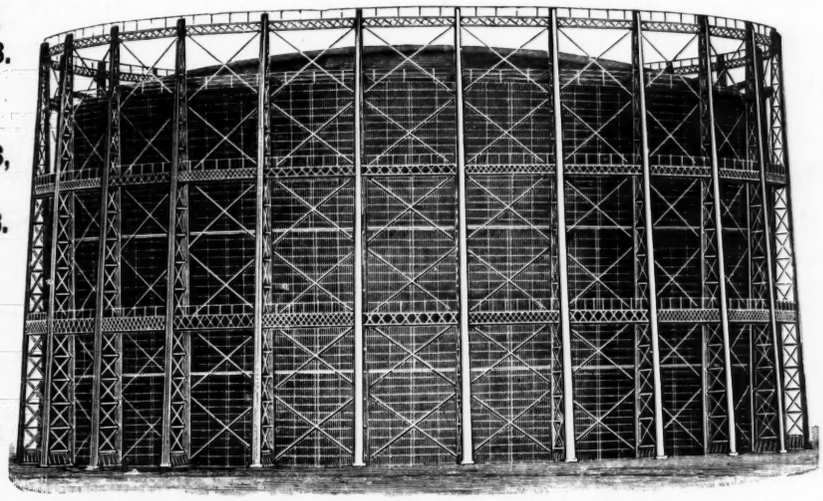
Telegrams: "GASOMETER GLASGOW." **GLASGOW.**

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.



GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

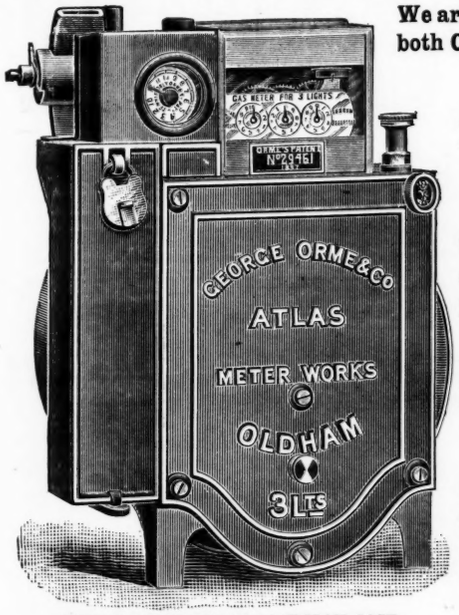
GEORGE ORME & CO.

(BRANCH OF METERS LIMITED)

ATLAS METER WORKS, OLDHAM.

Manufacturers of

ORME'S PATENT IMPROVED COIN METER.



WET COIN METER IN CAST-IRON CASE.

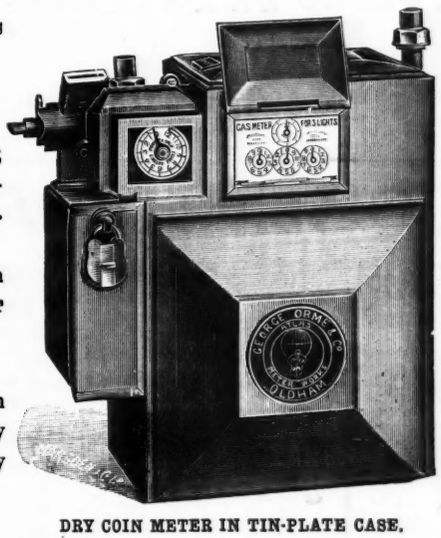
We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



DRY COIN METER IN TIN-PLATE CASE.

Any further Particulars sent upon application.

Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

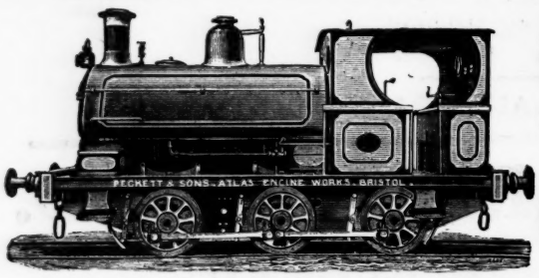
Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

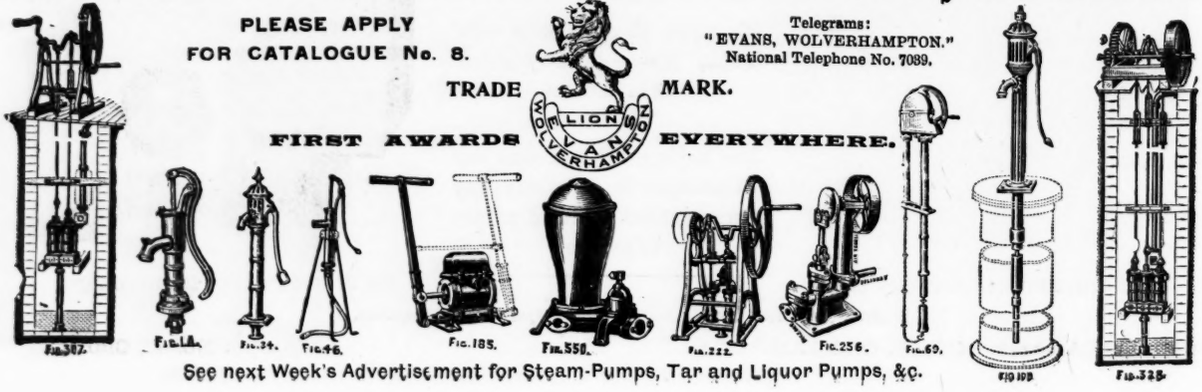
JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

PLEASE APPLY FOR CATALOGUE No. 8.

Telegrams: "EVANS, WOLVERHAMPTON." National Telephone No. 7089.

TRADE MARK.

FIRST AWARDS EVERYWHERE.

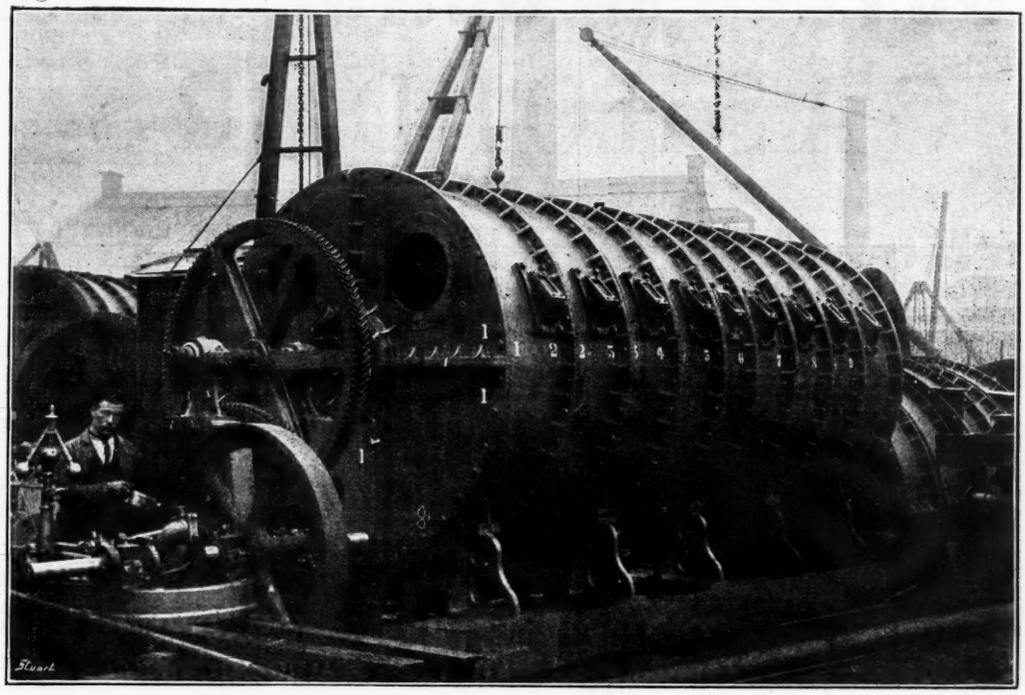


See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

W. C. HOLMES & CO.'S

PATENT "NEW" SCRUBBER-WASHER

All Sizes from 50,000 to 5,000,000 Cubic Feet of Gas per Day.



The "NEW" Scrubber-Washer can be arranged to suit all cases of the Washing of Gases with Liquids.

NOTE: Orders already received in 1900 for MACHINES to deal with 36,550,000 Cubic Feet of Gas per Diem.

PATENTEES AND SOLE MAKERS: W. C. HOLMES & CO., WORKS: HUDDERSFIELD.

Telegrams: "HOLMES, HUDDERSFIELD." Contractors to Her Majesty's Government. Cablegram: "IGNITOR, LONDON."

R. LAIDLAW & SON

ENGINEERS & IRONFOUNDERS.

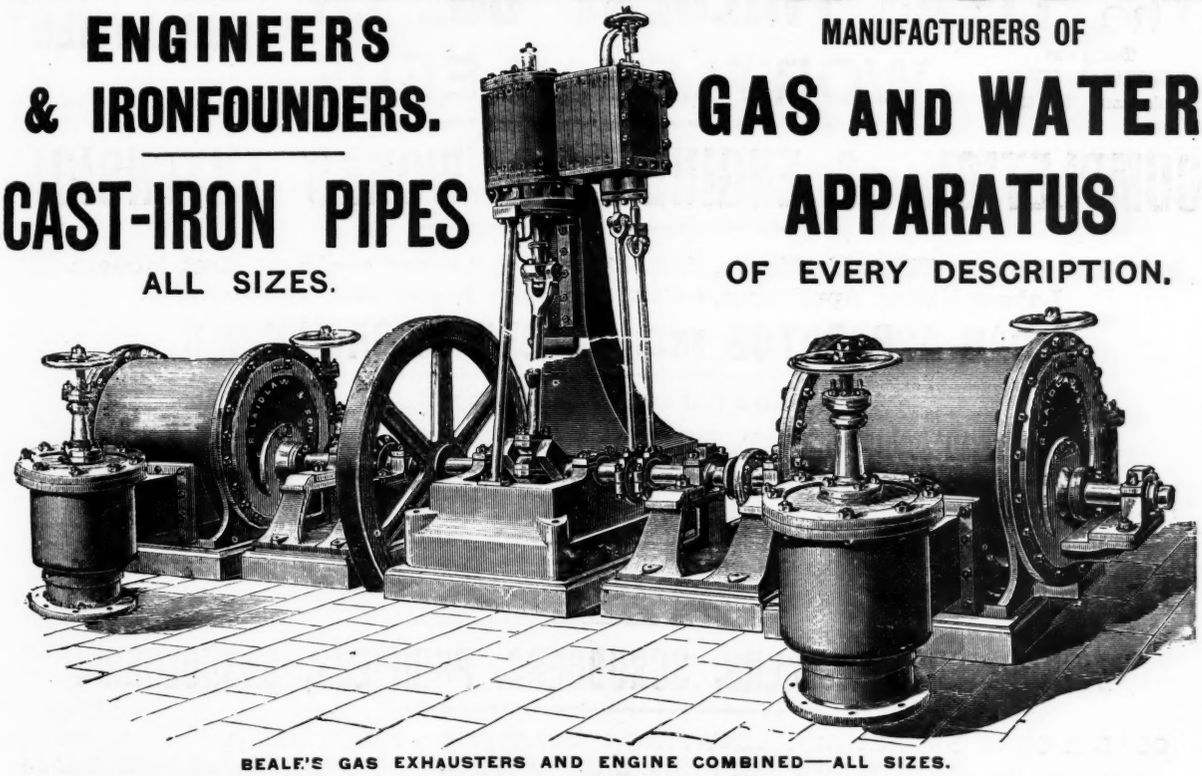
MANUFACTURERS OF

GAS AND WATER APPARATUS

OF EVERY DESCRIPTION.

CAST-IRON PIPES

ALL SIZES.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED—ALL SIZES.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

S. CUTLER AND SONS, MILLWALL, LONDON.

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION

CUTLER'S PATENT GUIDE-FRAMING HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

Carburetted Water-Gas Plant.

SPECIAL DESCRIPTIVE CATALOGUE ON APPLICATION.

PATENT WATER-TUBE CONDENSER

Over 120 now in use.

Cutler's Patent Freezing Preventer

For keeping Cups of Gasholders free from Ice.

CHARLES HUNT PATENT GAS-WASHER.

The LEEDS FIRECLAY CO., LD., ENGINEERING DEPARTMENT

Telegrams: "SETTINGS, LEEDS." Telephone: No. 1332.

WORTLEY, LEEDS.

COMPLETION of ENGINEERING WORKS EXTENSION.

THE LEEDS FIRECLAY CO., Ltd., having equipped themselves with the **Most Modern Labour-Saving Appliances,** are now in a position to undertake every description of

GAS APPARATUS FROM RETORT TO GASHOLDER.

They have laid themselves out specially for

RETORT HOUSE APPARATUS

RETORT SETTINGS OF EVERY DESCRIPTION.
Inclined, Horizontal, Regenerator, and Direct Fired.

SHALLOW REGENERATORS A SPECIALITY.

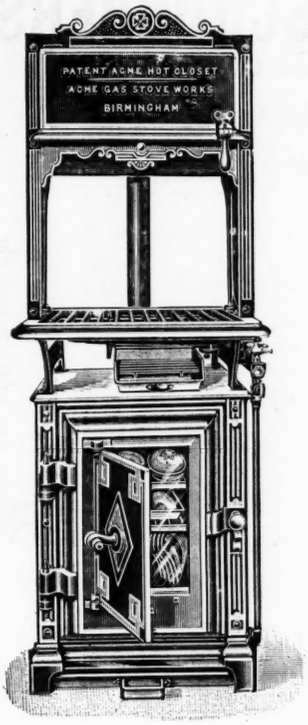
RETORT MOUTHPIECES with Self-Sealing and Luted Lids.
BENCH, FLOOR, FURNACE, and RETORT IRONWORK.

CONDENSERS, WASHERS, SCRUBBERS, PURIFIERS, GASHOLDERS.

COAL & COKE BREAKING, ELEVATING & CONVEYING MACHINERY.
STORAGE HOPPERS, CAST & WROUGHT IRON TANKS, ROOFS, &c.

CONTRACTORS FOR COMPLETE GAS-WORKS.

THE LATEST AND MOST SUCCESSFUL DEVELOPMENT IN GAS-STOVES.



THE

"ACME" GAS-COOKER

Fitted with the Patent

HOT CLOSET & GLASS DOOR,

Has been a long-felt want in all Households, and costs nothing extra to Heat as all the Waste Heat from the Oven is utilized.

WRITE FOR PARTICULARS.

THE ....

Eagle Range Gas-Stove Co. Ld.

ACME GAS-STOVE WORKS, BIRMINGHAM.

GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone: No. 8013.

GAS ENGINEERS, CONTRACTORS, RETORT SETTERS.

Patent REGENERATIVE SETTINGS,

GIBBONS & MASTERS' PATENT No. 1269, 1893.

SUITABLE FOR WORKS OF EVERY CAPACITY,

AND A SPECIAL FORM OF WHICH IS APPLICABLE TO

GASEOUS FIRING WITH A MINIMUM EXCAVATION.

RETORT-BENCH IRONWORK, CONDENSERS, SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

630,000,000

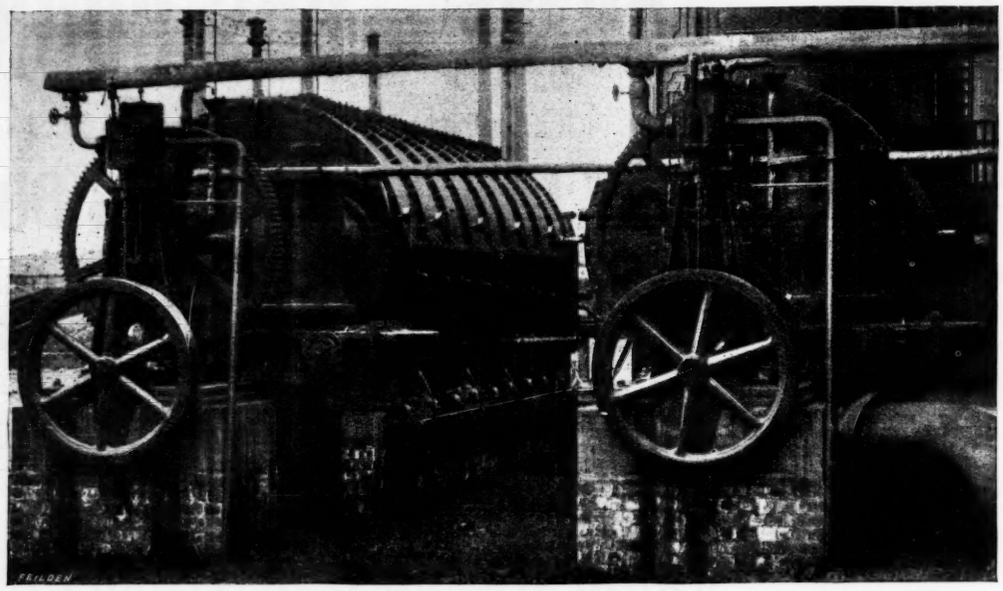
Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed

Strength of Liquor Concentrated.



Maximum Washing Surface.

Easy access to interior.

PHOTO. OF MACHINES RECENTLY ERECTED AT THE SCULCOATES WORKS, HULL.

KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

AMERICAN GAS OIL

SOLE IMPORTERS—

ANGLO-AMERICAN OIL COMPANY, LIMITED.

This well-known quality of Oil is used at most of the Corporation Works and Companies' Works throughout the United Kingdom. Contracts have also been entered into with several of the large Railway Companies.

LARGE STOCKS. PROMPT DELIVERY.

Stock of about 30,000 Tons is usually carried by us at our Installations at Avonmouth, Birkenhead, Barrow, Manchester, and London.

HEAD OFFICE:

22, BILLITER STREET, LONDON, E.C.

HUMPHREYS—GLASGOW

CARBURETTED WATER-GAS PLANT

These instances are all from the LONDON designs of Messrs. HUMPHREYS & GLASGOW.

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Copenhagen	700,000	Coventry	600,000	Lawrence, Mass.	400,000
Copenhagen (Second)	2,500,000	Coventry (Second)	600,000	Commercial Gas Co.	850,000
Belfast	1,700,000	Bordentown, N.J.	125,000	Commercial (Second)	850,000
Belfast (Second)	4,500,000	Winchester	225,000	Commercial (Third)	1,250,000
Brussels	750,000	Shanghai	225,000	Rotterdam	850,000
Brussels (Second)	750,000	Stockport	600,000	Dorking	150,000
Liverpool	3,500,000	Norwich	1,000,000	McKeesport, Pa.	500,000
Liverpool (Second)	4,500,000	Holyoke, Mass.	600,000	G.L.&C.Co., Bromley	3,750,000
Tottenham	750,000	St. Joseph, Mo.	750,000	G.L.&C.Co., Nine Elms.	2,750,000
Tottenham (Second)	750,000	Lea Bridge	350,000	Durham	200,000
Santiago de Cuba	400,000	Lea Bridge (Second)	350,000	New York	4,000,000
Swansea	750,000	Stockton-on-Tees	500,000	Scarborough	800,000
Manchester	3,500,000	Edinburgh	2,000,000	Perth, W.A.	125,000
Brighton	1,750,000	Guildford	350,000	Bremen	550,000
Preston	1,400,000	Brentford	1,200,000	Maidenhead	225,000
New York	1,200,000	Syracuse, N.Y.	850,000	Epsom	225,000
Southport	750,000	Bridlington	150,000	North Middlesex.	150,000
Bath	1,000,000	Middlesbrough	1,250,000	Wandsworth.	1,800,000
Newburg, N.Y.	350,000	Croydon	1,250,000	Aarhus	800,000
Newburg (Second)	250,000	L. & N.W. Ry., Crewe	700,000	Falmouth	150,000
Hoylake	125,000	Taunton	225,000	Southampton	800,000

SINCE JANUARY 1ST, 1899.

Hartlepool	750,000	Brussels	1,000,000	Staines	600,000
Utrecht	1,000,000	Brighton (Second)	1,850,000	Commercial (Fourth)	2,000,000
Deventer	150,000	Stockport (Second)	600,000	Dublin (Second)	2,000,000
Portsmouth	1,000,000	Croydon (Second)	625,000	Faversham	200,000
Bournemouth	1,000,000	Maidenhead (Second)	225,000	Birmingham (Swan V'ge)	1,500,000
Aylesbury	150,000	G.L.&C.Co., Beckton	2,250,000	St. Gallen (Switz.)	225,000
Hamburg	1,750,000	G.L.&C.Co., Fulham	1,750,000	Colney Hatch	400,000
Redhill	275,000	Tottenham (Third)	350,000	Southampton (Second)	500,000
Dublin	2,000,000	Sydney (Harbour)	500,000	Tunbridge Wells	1,000,000
Posen	450,000	Sydney (Mortlake)	500,000	Hebden Bridge	200,000
Dunedin (N.Z.)	150,000	Manchester (Second)	3,500,000	Chorley	300,000
Lincoln	500,000	Hull	1,500,000	Liège	1,000,000
Antwerp	1,500,000	Longton	600,000	Stafford	500,000

[The 1891 Installations of The Gaslight and Coke Co., 12,000,000 Cubic Feet Daily.]

Total Capacity above 116,800,000 Cubic Feet Daily.

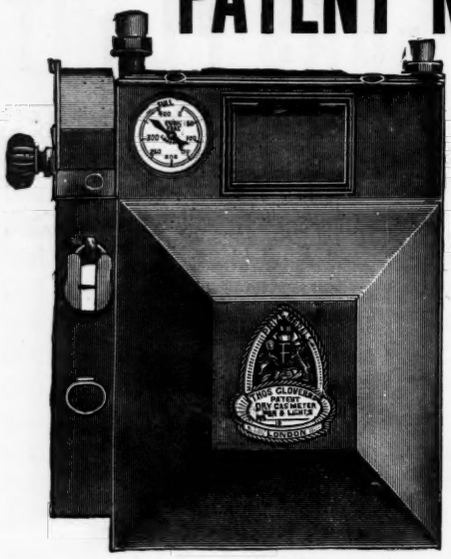
United States Total 246,550,000 Cubic Feet Daily.

Grand Total - 363,350,000 Cubic Feet Daily.

9, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY, LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING, NEW YORK.

THOMAS GLOVER & CO.'S PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,
DRY GAS-METER MANUFACTURERS,
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C

BRISTOL: 28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address:* "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 3398.

GLASGOW: 69-71 McALPINE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107.

W. PARKINSON & Co.

PREPAYMENT GAS-METERS

GUARANTEED FOR FIVE YEARS.

Many thousands in use in all parts of the Country.

COMBINE
SIMPLICITY with
STRENGTH, and
ACCURACY with
COMPACTNESS.

COTTAGE LANE WORKS, CITY ROAD.
LONDON.
Telegrams: "INDEX." Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegrams: 'GASMETERS." Telephone No. 1101.

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE.
The Report and Accounts of the Gaslight and Coke Company . 267
The Report and Accounts of the South Metropolitan Gas Company 268
The North British Association Meeting 268
Parliament and the Coal Question 269
The Coke Market 269
Trade Unionism and Railways 270
Mutual Schemes under the Compensation Act 270
The Amalgamation of the Incandescent Gas Companies . . . 271
Washing Up! 271
WATER AND SANITARY AFFAIRS—
The Hot Weather and Water Supply in London and Paris . . 271
The "Lancet" on the Metropolitan Water Supply 272
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 272
Electric Lighting Memoranda. 272
Some Curious Tests of the Air of a Room 273
The Gas Supply of Boston (Mass.) 274
Utilizing the Waste Heat from Gas-Engines 275
Municipal Gas Supplies in Great Britain 276
Proceedings of the Registrar of Friendly Societies under the Workmen's Compensation Act. 277
The "Lancet" on the Metropolitan Water Supply 277
NOTES:—
Domestic Hot-Water Fitting 279
Paints upon Iron 279
Orde's Liquid Fuel Burners 279
TECHNICAL RECORD:—
North British Association of Gas Managers—Annual Meeting in Edinburgh—
General Business 280
Inaugural Address of Mr. W. Ewing, of Hamilton. 280
Mr. W. Young on Some of the Principles of Gas Manufacture, and their Practical Application 282
British Association of Water-Works Engineers—Dr. A. C. Elliott on the Strength of Bricks and Brickwork 289
Incandescent Gas Lighting in Paris. 290
REGISTER OF PATENTS:—
Gas Engines and Motors—Theryc, C. 290
Regenerator Settings—Broadhead, J. W. 291
Fractional Scrubbing and Washing of Gases (also applicable to the Fractional Distillation of Liquids and Condensation of Vapours)—Young, W., and Glover, S. & T. 291
Gas-Motors—Bellamy, A. R. 291
Coin-Freed Apparatus for Gas-Meters—Stansfield, A., and Meters Limited 291
CORRESPONDENCE:—
Electric Lighting at Hastings. 292
The "Transactions" of the British Association of Water-Works Engineers 293
PARLIAMENTARY INTELLIGENCE:—
House of Lords—Progress of Bills 293
House of Commons—The Export of Coal; Progress of Bills . . 293
The Parliamentary Committee on Municipal Trading 293
LEGAL INTELLIGENCE:—
The Manufacture of Water Gas at Horsham—Alleged Nuisance . 294
The Welsbach and Sunlight Settlement 294
Compensation for Injuries Caused by the Explosion of a Gas-Meter 295
The Alleged Theft of Water from the East London Company . . 295
The Oystermouth Water Company Fined 295
Another Water Waster Fined 295
MISCELLANEOUS:—
Gaslight and Coke Company—Report and Accounts 295
South Metropolitan Gas Company—Report and Accounts . . . 297
Crystal Palace District Gas Company—Report and Accounts . . 298
Brentford Gas Company—The Half-Yearly Report and Accounts 298
The London County Council and the Testing of Gas 299
London Local Authorities and the Price of Gas and the Gas Question 299
Meeting of the New Sunlight Incandescent Company, Limited . 300
The Sulphate of Ammonia Committee—Third Annual Report of the Committee; Report of the Agricultural Adviser 301
Sales of Stocks and Shares 302
Manchester Corporation Gas Supply—Annual Report and Accounts 303
Birmingham Corporation Gas Supply—Increase in the Price of Gas; The Retirement of Mr. Edwin Smith 304
Meeting of the Devonport Gas Company 305
The Leamington Corporation and the Gas-Works 306
Purchase of the Shipley Gas-Works by the District Council . . 306
The Proposed Royal Commission on Coal Supply 306
Felling a Chimney at the Saltley Gas-Works, Birmingham . . 306
Electric Lighting Notes 307
The Clay Cross Water-Works Arbitration—Settlement Arrived At 308
Notes from Scotland 308
Gas and Water Companies' Stock and Share List 308
Current Sales of Gas Products 310
Coal Trade Reports. 311
PARAGRAPHS:—
PERSONAL: Mr. James Currie; Mr. J. Bruce; Mr. W. A. Surridge; Mr. Edward Marfleet; Mr. W. J. Warner; Mr. J. Ferguson Bell; Mr. A. Horace Brookman; Mr. A. Waddell 278
OBITUARY: Mr. Reginald Arthur Gandon; Mr. George Auldjo Jamieson; Mr. James Wilson, M.Inst.C.E. 279
The Gas Examinerships of the London County Council—Manchester and District Junior Gas Association—The Prize Winners at the City and Guilds Examinations 272
The North of England Gas Managers' Association and Workmen's Compensation, &c., Insurance 282
The Heckmondwike District Council and the Gas-Works . . . 292
Gas Explosion in Manchester—Fatal Fire at an Oil Gas-Works . 293
New Buildings for the Manchester Gas Department 295
Local Authorities and Sources of Water Supply 299
Water Supply for Littleport 300
Gas Poisoning in Belfast 302
New Zealand Coal Supplies—The Cowlyd Water Board Negatives their Engineer's Recommendations 306
New Reservoir at the Bognor Water-Works 310
The West Cumberland Water Scheme—Gas Profits at Todmorden 311
Burry Port Water Supply—Seville Water-Works Company, Limited—The Falmouth Corporation and the Water-Works—North Warwickshire Water Bill—Otley Water Scheme . . . 312
Some of the Costs of the Derwent Valley Water Scheme—Unreasonable Use of Water by Leeds Publicans 313

EDITORIAL NOTES.

The Report and Accounts of the Gaslight and Coke Company.

THE report of the Directors and the statement of accounts relating to the past half-year's working of the Gaslight and Coke Company have been issued; and the ordinary general meeting of the proprietors will be held on Friday. The report states that, after providing for fixed charges, there will remain a balance available for distribution of £626,602, out of which the Directors recommend the payment of a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, carrying forward £296,755. It is next stated that the sales of gas show an increase of 3·3 per cent. for the half year, which is the best thing in the whole story. Not another gleam of sunshine is to be found, either in the report or the accounts; and it will tax to the uttermost the official optimism which has so often stood in the way of reform at the Horseferry Road, to extract much satisfaction from the existing facts. Coal has been bought at an advance of 8s. a ton, only one-fourth of which can be recovered in higher returns from residuals. Mention is made of the increase in the price of gas by 6d. per 1000 cubic feet as from last month; it being explained that this is only a "net increase of 5d., "having regard to the reduction of 1d." made last January. The effect of the increased price on the dividend is also stated; and the Directors remark that their action "in rais- "ing the price of gas has been criticized by Local Authori- "ties and others, who have evidently failed to appreciate the "fact that, under present legislation, the consumers of gas "cannot be subjected to an increase in the price they have "to pay without the proprietors of ordinary stock being "at the same time subjected to a corresponding reduction "in the rate of their dividend." This is childish. Do the Directors imagine that it would cause the smallest pang to a consumer of gas whose bill had been suddenly and largely increased, to learn that the shareholders were getting no dividend at all? On the other hand, can it be supposed that the shareholders' loss of dividend affords the slightest gratification to the consumers of gas? The report seems to imply that the essence of the sliding-scale consists in its vindictive aspect; but this is to sadly misunderstand the position. When this aspect of the matter is in question, the comparison of effects cannot be excluded; and it is not to be supposed that the grumbling consumer will be placated by being told that, for every sixpence extra he pays, the shareholders forfeit a penny.

"It is with regret" that the Directors have to report the rejection once more of a Money Bill of theirs by a Committee of the House of Commons. This is a mild confession, to say nothing more. We notice that a financial newspaper calls "a very clumsy joke" the remark of the Directors in this connection that the lost Bill was drawn up "to secure, in the interests of the consumers, the raising "of the necessary capital at the lowest possible rate." But the statement is strictly and literally true. There is an unctuousness about the way of putting it which had been better avoided; but there can be no question as to the fact. Unhappily, this is the worst of it. In itself, the Bill was unexceptionable; and it was a necessary measure. But Parliament would not trust the Directors with any more money. That is the position which, as we observed last week, the Chartered proprietary has to face. Of course, there is nothing reassuring about this state of things in the report. The Directors could hardly be expected to say that the persistent hostility of Parliament to their Bills had cast upon them the responsibility for seriously considering their position. These gentlemen, honourable and well-meaning men as all the world concedes, may be doing so, for all that is known. It cannot be pleasant for them to realize that the undertaking for which they are answerable to the owners is floundering on from one parliamentary rebuff to another. On the other hand, the smooth paragraphs of the report may equally cover an advanced state of dry-rot in the Board-room. Mention is made of the other parliamentary concerns of the Company for the session; and the report concludes with the usual assurance that the plant of the Company is in good order.

The accounts show that a net amount of £68,690 was added to the capital expenditure during the past half year, mostly for new and additional mains and services, meters, and stoves. No fresh capital has been received; and there remains unissued £250,000 of 4 per cent. ordinary stock

and £200,000 of 3 per cent. debenture stock. In the revenue account, gas stands for £1,629,434, which is about £20,000 to the good; while residuals have brought in £592,971, as compared with £438,231. All the items show considerable advances; but, of course, the greatest is in coke, which has improved by upwards of £100,000. On the other side of the account, coals and other materials for gas manufacture have risen from £682,741 to £833,451—a sharp advance, seeing that the coal contracts were at the old figure. Probably the carburetting proved an expensive luxury. Wages (carbonizing) went up from £161,548 to £174,194; and purification cost considerably more, probably through the dearness of lime. Repairs and maintenance, both of works and mains, have dropped. For the first time, a separate entry for "Gas-Fittings (Automatic Meter "Supplies)" accounts for £26,574, which would seem to indicate that a serious attempt is to be made to reduce the outstanding credit under this head. Rates and taxes have gone up again, badly as the concern can bear the impost. It is satisfactory to note that only £886 has gone for workmen's compensation, as it speaks well for the care which is being exercised over the Company's industrial operations. On the whole, the leading feature of the accounts is the advantage that has been reaped already from the improved state of the residuals market; while the coal does not show the full effect of the advance. The dividend payable is decreased from £367,330 to £329,847, or by £37,483, which is the price the shareholders pay towards squaring the account on the new basis. There is nothing to be said regarding the other accounts, except perhaps that the details of the "oil-gas" manufacture are not at all intelligible as they are now given.

The Report and Accounts of the South Metropolitan Gas Company.

The Directors' report and the half-yearly accounts of the South Metropolitan Gas Company have also come to hand. The document begins with the somewhat abrupt remark—"History repeats itself—but with a difference." This observation pleasingly excites interest in what is to follow, which proves to be the necessary, but by this time familiar, explanation of the reason for the increased price of London gas. As might be expected, the matter is dealt with in an illuminating style by Mr. George Livesey, Chairman of the Company, who happens to be one of the veteran band of gas managers that bore the brunt of the coal famine of 1873. From coal famine to sliding-scale is but a step; and, again, Mr. Livesey is the man who made it. For this reason, among others, he treats the great gas settlement of 1876 with a grasp of the principles involved which few other gas directors can hope to equal. He is the master, while they are necessarily but amateurs. Very remarkably, the additional storey which Mr. Livesey added to the structure of 1876—the South Metropolitan profit-sharing scheme—so far from overloading the original foundation, seems to have added stability to the edifice. Is it not the truth that, when a building is in danger of being shaken by those "rhythmic oscillations" which proved so destructive to the walls of Jericho, a good remedy is to put a heavy weight on the top? In the case in point, the experiment has succeeded to admiration. Profit-sharing added 9 per cent. to the earnings of the Company's officers and servants—a very handsome premium on good service. The present year's increase of price has swept it all away. Do the men complain? Not they. Like Englishmen all the world over, when face to face with the stern realities of things, they are prepared to take the rough with the smooth. So with the South Metropolitan consumers of gas. Served with notices of the heaviest increase of price in all London, they know that it cannot be helped. Such is the reward of a good commercial reputation.

A truly wonderful statement is made in the report respecting the growth of the South Metropolitan undertaking. For the half year, the increase in consumption has been at the rate of 12 per cent.—in actual amount, 590 million cubic feet. The growth of the Gaslight and Coke Company for the same period is 359½ million cubic feet. So the smaller undertaking is overtaking the larger. Well may the report state that the proprietors may be assured "that they need "have no fear as to the stability of their property, that the "cloud will pass, and that when coal returns to a reasonable price—certain to come—their old prosperity will be "renewed." A very modest reference is next made to the success of the Company's Bill this year; but this reticence is made up for by some hearty abuse of the London County Council for promoting the Portable Photometer Bill. The concluding paragraph of the report is devoted to an explanation of the dividend; making it clear that the Midsummer increase of price will only be felt by the proprietors to the extent of the fall of dividend from 5⅛ to 5 per cent., owing to the full dividend not having been paid heretofore.

The accounts exhibit the rate at which the undertaking is forging ahead. A net capital expenditure of £82,101 has been necessitated. The form of accounts now includes a statement showing the actual amount of money raised and expended, which obviates all mystery by reason of stock conversion. The revenue account gives the numbers of meters, stoves, and fires in use, in their different categories. The receipts from gas amounted to £589,887, as compared with £521,551 for the corresponding period of last year. Residuals brought in £303,747, as compared with £223,626. Gas manufacture cost £606,931, instead of £448,092; thus showing that the effect of dearer coal had already been felt. Distribution actually cost less. Rates and taxes have gone up slightly. The gross profit balance is £176,617, as against £192,174. The balance-sheet shows that the Company are working with a temporary loan of £140,000. The dividend is just cleared, and that is all. The amount of workmen's bonus and savings deposited with the Company has risen to £40,879. It is not surprising, in the circumstances, that at the meeting authority will be taken to raise £250,000 of further capital by the creation and issue of ordinary and debenture stock. We regret that it was not permitted to the Directors to announce to the proprietors that the Nine Elms works and district would shortly become their property; but the Fates, in the bodily shape of the House of Lords Committee, denied them this gratification, and it is by no means clear that the bargain is not indefinitely postponed.

The North British Association Meeting.

The North British Association meeting in Edinburgh last week was eminently satisfactory from the point of view of the person who looks at the outward appearance of things. There was a more than usually full attendance; a programme which, had it been possible to carry it through, would have been (to say the least) more than a fair day's work; subjects some of which were new, and others of which were sufficiently important to be worthy of subjection to the kaleidoscopic treatment of public discussion; there was abundance of discussion; there was, moreover, much harmony; and there was nothing tiresome. These things all go to make a successful meeting; and that the meeting was successful, in very large measure indeed, there is no gainsaying. There is no disposition here to belittle the proceedings. But does not a closer look at what took place go to show how far Scotland has travelled away from the unique position which she held in gas matters, and held till quite recently? When was there ever a meeting of gas managers before, in Ultima Tweed, at which the subject of the illuminating power of the gas was not mentioned? It was not on the *agenda* this year—it was not even mentioned; and probably for the first time the members were not reminded that it was light they sold and not gas. These were some of the things which were not. Of those which were, were observations upon the working of inclined retorts and the use of carburetting in the improvement of coal gas—subjects which, a quarter-of-a-century ago, would have made a cannel man (metaphorically) take a pinch of snuff and mutter "humph."

There is a proverb about necessity and strange bedfellows which receives application here. Were it not for the rapid exhaustion of cannel coal in Scotland, there would not be the same earnest attention among Scotsmen to projects for cheapening the production of gas which the Edinburgh meeting shows to exist. There is in this, to be sure, no sign, by any means, of decay. It is the other way. The old trunk of sturdy Scotch gas management—independence—has vitality enough left to graft upon itself the vigorous saplings of what has hitherto been regarded as the undergrowth of gas production. It is the change to which we wish to draw attention; and our reason for doing so is that this meeting emphasizes that there is a change more than any previous one has done. It has been borne in upon some minds of late years, but it has never yet been acknowledged, even tacitly, that the ground was shifting. Scotch gas managers have not been finding their way South in recent years. Rather managers from the South have been going North. This state of matters will now cease, it is to be presumed. But, for the present, the distinction

of Scotch gas has departed; and gas managers in Scotland will be as they are in other lands—except, it may be, for that *perfervidum ingenium* which their race is reputed to possess, and which they may be trusted to apply in this as in other matters.

To treat of the individual papers in a word or two. Mr. Herring's was an educative production—very much so. By means of it he gave his northern colleagues a standard by which to measure their own attainments—needless to say almost entirely measuring downwards. Mr. Lighbody made out a good case for giving better treatment to the consumer by prepayment meter, who, it is to be feared, is, in many cases, being looked upon as the milch-cow of the undertaking. Mr. Forbes Waddell's paper was more of a theorem, notwithstanding that it was based upon experiment. Had it been practice instead of experiment, it would have been more useful. The paper which was contributed by Mr. W. Young, of Peebles, but which, it is to be regretted, he was unable to be present to read, was a characteristic production of the fertile brain of the distinguished gas philosopher who lives by the Tweed. His writings require the application of mind. They are more suited for fireside reflection than for off-hand discussion; and it is fortunate that the Association resolved to accept the paper and to publish it. It will be of more real service in present study than it would have been in prospective reading followed by remarks evolved on the spur of the moment at next year's gathering.

Parliament and the Coal Question.

At the fag end of a listless session, efforts are being made to enlist the interest of the House of Commons and the Government in the present abnormal condition of the coal trade, especially with regard to the question of the enormously increased quantities of coal that are being exported to other countries. Questions have been put both to Mr. Balfour and to the President of the Board of Trade, not so much for the purpose of eliciting information (which is available to everyone), but in order to bring the fact before the public that the present high price of coal is due to a scarcity caused by heavy exportations. We cannot but think that the attempt on the part of some Members and of a section of the Press to alarm the public by representing that European nations in general, and France in particular, are sucking this country dry of smokeless coal, while they themselves are piling up great stocks of that commodity, preparatory to making war upon us, is entirely unjustified by ascertained facts, and is highly discreditable to the alarmists. Nothing is more likely to bring about an absolutely causeless war than the preaching in both England and France—as is most certainly being preached in each of these countries—the doctrine that the other is anxious to wound and is preparing to strike.

The statement has been sedulously circulated that steam coal from Wales is pouring into Calais daily, and is being immediately whisked off to some secret storage-place for use when the "Gallic horde" is ready to descend upon our defenceless shores. Yet what do we find when coming to close grips with facts? Turning to the consular reports, we learn that the great increase of coal imports into France from this country in 1899 was, in one district, "attributable to the remarkable development in the metal-"lurgical industries;" in another, "to the demand of the "factories at Hennebont." While, further, Mr. D. A. Thomas, M.P., who of all men is in the way of knowing, says that "France is not taking more steam coal than "usual." If, again, we turn to the details contained in some of the would-be alarmist reports, it is found that, out of five large vessels stated to have been recently unloaded at Calais, two were from Newcastle, two from Sunderland, and only one from Wales. Doubtless France—in common with other countries—is buying Welsh coal for her Navy as she always has done; but where is the evidence of abnormal purchases of sinister significance? No one but the coalowner, miner, and merchant is pleased at the present price of coal; but that is no reason why we should create bogeys for our own alarming—fraught as the useless process is with the risk of turning imagined into realized peril.

Apart, entirely, however, from the alarmist agitation stands the legitimate demand, which we have consistently supported, for an official inquiry into the question of our coal resources, consumption, and export, in the course of which special heed might and certainly should be given to the necessity of our retaining a proper supply of steam coal for use by our first line of defence, the Navy. That is one of the principal points made by Mr. A. D. Provand, the member for the Blackfriars division of Glasgow, in a letter which he has addressed to Mr. Balfour (to be found in another page of this issue) in continuation of his former plea for the appointment of a Royal Commission. Mr. Provand puts the case for the institution of a commission of inquiry on very much the same grounds as those on which we have always recommended such a step—viz., that, "even if no "recommendations of moment are made by the Commis-"sion, it would, generally speaking, still be of enormous "advantage for us to know the truth as far as it is ascer-"tainable, so that we might set our house in order," or, we may add, set our minds at rest. Mr. Provand also refers to another aspect of the question that is of much interest and importance to coal consumers in this country—that of the growth of the American coal trade and the prospects of considerable competition of American with British coal in the future. So many conflicting opinions are expressed by interested persons—opinions doubtless, if perhaps unconsciously, coloured by the direction of their interest—as to the probabilities of such competition, that it would be of no little value to have the question fully and impartially investigated as regards the cost of mining in the two countries, the cost of transit from America to ports now supplied by British vessels, and the relative quality of the coals of this country and of the States.

We certainly do trust that the Government will be persuaded to grant the asked-for inquiry; but, unless the Commission be speedily appointed and conclude its labours within a reasonable period of time, the exciting cause of the present agitation—the high price—will have passed away before the report appears. The coming winter may, indeed, witness a continuance or even a surpassing of the ruling abnormal prices. The loud proclamations of famine prices by the coal merchants are possibly inspired rather by the wish than by the certainty; but there can be no doubt that the impending severe "slump" in the iron trades (a "slump" that will be the more severe the longer that coal remains dear) will in the course of no very long time react sharply upon the coal market. No careful observer can have failed to realize that the iron and steel trades are at the present moment in a position as doubtful and unpromising as that in which they stood twelve months ago appeared assured and cheerful. Coal buyers will not have to play second fiddle to coal owners for an indefinite period.

The Coke Market.

Of importance to the gas industry almost equal to that of the future of the coal market are the prospects of the coke trade; for thereon depends whether the demands of the coal-owners spell serious diminution of profits or merely contra entries in the accounts. These prospects being affected in no small degree by the operations of the Gaslight and Coke Company, the results of the tenders recently invited by that Company in the advertisement columns of the "Journal" will be of considerable interest to our readers. The coke offered for sale was the Beckton and some of the Nine Elms manufacture for the year commencing on the 1st of October next—in all, we take it, rather more than one-third of the Company's sale coke for that period. The minimum price fixed for tenders was 22s. per ton; and, judging by the allotments that have come to our knowledge, the quantity offered was fully tendered for. When it is remembered that the minimum tender price a year since was 15s., and that the same coke was selling three or four years ago at well under 10s., it will be seen that the increase in the price of coke has exceeded the rise in the price of coal. This, of course, is not the same thing as saying that the enhancement of coke values has compensated for the advance in coal, as every shilling on to coal requires for its counterbalance practically two shillings a ton on coke. But it is obvious that the estimate of the possible recoupment from residuals during the year to June, 1901, which we put forward in our issue for the 3rd of April last, was well within the mark. It does not, we know, follow that because the Chartered Company have been able to sell a third of their coke at something over 22s. a ton, the same price will be obtained throughout the next twelve months for day-to-day sales at the works. But the knowledge that contracts have been closed at such prices will tend to sustain the market for some time to come; and there will be little fear of the Metropolitan and other Gas Companies not realizing good returns

from coke so long as coal keeps at or above its present level. The economic effects of these tremendous prices for fuel will be, and are being, widely felt. The cement maker will be hard hit, and will naturally try to get some of his money back from the gas companies in the price of lime for purification and cement for building; the laundry proprietor is putting up his prices (so the coal merchant, in common with the rest of us, will have to pay more for the luxury of clean linen); while the nurseryman declares that a pound a ton for greenhouse fuel spells workhouse for him. The coal and coke merchant is, we fancy, in for a big gamble this winter; and it is well for the community that the weather clerk is beyond the reach of cajolery or corruption. An open winter will see some of the coke and coal grumblers with lengthened faces. Meanwhile the Westminster authorities have certainly secured a comfortable price for their next year's contract coke.

Trade Unionism and Railways.

ANOTHER example of Trade Unionism "in being" has been afforded for the instruction of the British public during the past week or two, in the threatened strike of railway men belonging to the Great Eastern system. For some time subterranean mutterings "might have been "heard," as the old school of novelists would have said, in the neighbourhood of Liverpool Street and Stratford. Originally, the servants of the Great Eastern Railway Company, of the Metropolitan and Suburban sections, wanted more money and some other advantages. The Directors of the Company were prepared to meet their employees, and were also willing to grant them as many concessions as the condition of the affairs of the Company permitted. The Amalgamated Society of Railway Servants, although not commanding the allegiance of a majority of the Great Eastern Company's men, undertook to work this agitation for all it might be worth, including possibly that meed of "recognition" for which all such Trade Unions pine. Organization proved good for something; and, somehow, when the men employed on the line elected their first set of 19 delegates to meet the Board and talk over their differences, these proved to be with one exception members of the Society! But this was not all. With a degree of arrogance which is Trade Unionism all over, these delegates demanded to be received as ministers plenipotentiary for the whole body of the Company's servants. The object of this bit of "try on," as the men would call it, was clear enough. It was to be a Society show; and everything the men might get would go to the credit of the Union. But the Directors did not see it. They called up 140 other representative men, and discussed grievances with them; leaving the Society 19 to go off and complain to their head and chief, Mr. Richard Bell, the General Secretary of the Society. Thereupon this outraged magnate set about his preparations for a strike of all hands in defence of the sacred principle of recognition of the Union; and a large number of silly men were found willing to arm Mr. Bell with signed strike notices. In order to further magnify the Society in the eyes of the world, it was ostentatiously arranged for the strike to begin just before the Bank Holiday, when the maximum of inconvenience and risk would have come on the travelling public. The Directors, however, stood firm, and set Mr. Bell and his anarchical scheming at defiance, with the result that this would-be dictator of the line has "seen the red light," and run away from his own threats. Not, however, before he had managed to advertise himself as having negotiated a settlement of the dispute with the President of the Board of Trade. The main point is that the strike has been declared "off" for the present; and the joke is that several people are claiming the honour and glory of bringing about this result. In fact, the Society have given in because they saw that it would never do to precipitate a disastrous conflict on a mere point of Trade Union punctilio.

The weakness of the Society's case was plainly pointed out in a dignified—almost sternly-worded—letter of the President of the Board of Trade, replying to a request from Mr. Bell that the Department should set the Conciliation Act of 1896 in motion. This application was a piece of impudence on Mr. Bell's part, because he is neither an employer nor an interested workman, and consequently has no *locus standi* in the affair. Still, some license is always taken by a professional agitator; and upon this occasion Mr. Bell had a number of strike notices in his pocket which he might have used to the ruin of the men who signed them, if not to the detriment of the Railway Company. As if this irregularity were not enough, the Editor of the "Daily News" must needs have a hand in the deal, and he claims to have been the intermediary between the Company and their men for the conveyance of messages which resulted in agreement on a basis for future negotiations. Meanwhile, the only persons who do not appear to have had a say in the matter are those most seriously concerned for the preservation of peace—the non-Society men who constitute the bulk of the Company's servants. The Directors and the chief officers will look after them, of course, and see to it that the Sim Tappertits do not get all the profit out of the situation. They have had their advertisement, which is more than good enough for them.

Mutual Schemes Under the Compensation Act.

WE publish to-day in another column some particulars, taken from the annual report of the Registrar of Friendly Societies, regarding the mutual schemes substituted by employers and employed for the exact provisions of the Workmen's Compensation Act. The report covering the first six months during which the Act was in force (noticed in the "JOURNAL" last October) did not indicate that this method of meeting the obligations of the new law was being at all generally adopted; and the statistics for the following twelve months now before us—that is to say, for the year 1899—naturally show even less indication. We say naturally, because the bulk of employers favouring such schemes were certain to formulate them soon after, or even before, the Act came into operation; and it is, we fear, too soon for the benefits accruing from the adoption of the mutual agreement plan to have made themselves sufficiently manifest to employers who, from a desire to be saved trouble—for the successful establishment and working of a mutual scheme requires preliminary and continued thought and care—or because of a prejudice against the Act and all its provisions, have elected either to insure against its risks or stand the racket themselves, to induce them to adopt what we deem the wiser course.

The schemes certified up to the end of 1898 embraced about 100,000 workmen; those sanctioned during 1899 about a further 10,000, *plus* all Government employees. The men, or at least their Unions, in some cases seem—judging from the Registrar's account of his correspondence with them—to have had serious doubts as to whether they might not really be compromising their interests by what is generally, but erroneously, known as "contracting out," in spite of the fact that no mutual scheme can be brought into operation unless the Registrar be satisfied that its provisions are at least as favourable to the men as those of the Act, nor, even if so approved, can be made compulsory. But it is evident, from the reports of the past year's working of the schemes sanctioned in 1898, that the operation of these agreements soon commends them to the workmen interested; for in the case of 72 per cent. of the schemes reported on, the whole of the men in the particular employment had become contracting parties, while in no case had less than 83 per cent. of the employees signed the agreements.

The whole cost of the schemes to the employers was, on the average, 1·9d. per man per week, more than one-third of which was carried forward as surplus. This payment, *plus* 1·4d. per week from each man, provided not only benefits equivalent to those granted by the Act, but also accident allowance in such cases as did not exceed two weeks in duration (and they were more than half of the total number), and for the first two weeks' disability in all other cases, as well as other benefits not contained in the schedules of the Act. Most of the agreements—among them that of the South Metropolitan Gas Company, which is still the only gas undertaking that has been enterprising enough to adopt a scheme—provide for the pensioning of the widows or other dependants of men accidentally killed, an arrangement which has always appeared to us to be infinitely preferable to the less troublesome, but also much less beneficial, provision made by the Act for the payment of a lump sum down. The French law, which was explained at considerable length in the "JOURNAL" some time since, combines most happily both plans—providing that the recipient of a pension may claim to commute one-fourth of such allowance, thereby obtaining a small amount of capital wherewith to buy a business (or mangle) without being afforded the opportunity to squander the whole of the awarded compensation.

We feel strongly disposed to reiterate the many arguments in favour of the mutual-scheme method of meeting

the obligations of the Workmen's Compensation Act which have been more than once urged in these columns, but will refrain from mentioning more than the one important advantage emphasized by the Registrar, and which might well be noted by His Honour Judge Parry and other critics of the Act—namely, the entire absence of any litigation in the settlement of claims. Nothing, as we have said before, is more fruitful of bad blood between masters and men than litigation over trivial amounts involving, maybe, large questions of principle; and bad blood is as great a source of weakness in the corporate as in the individual body.

The Amalgamation of the Incandescent Gas Companies.

On Thursday last, the shareholders in the New Sunlight Incandescent Company were called together to consider the agreement which had been provisionally entered into with the Welsbach Company for the amalgamation of the undertakings. The position of affairs was very clearly put before the meeting by the Chairman (Mr. J. H. Duncan), who said that, after many futile efforts on the part of the Directors of both Companies to come to an arrangement, the present negotiations had been brought to a successful issue by the intervention of a "mutual friend." It is, however, only fair to assume that the Kern patent case recently tried was an equally important factor in the settlement arrived at. Mr. Duncan stated that, although judgment in this action would now in all probability never be given, it was the opinion of those in Court during the trial that the Sunlight Company had won "hands down." Highly important as this action was, however, there was another one pending—that relating to the Welsbach 1893 patent—which, had it come to trial, would, in any event, have been fraught with far more serious consequences. A decision in favour of the Welsbach Company would have had the effect of stopping the Sunlight Company's trade; while a victory for the latter would have resulted in practically throwing open the incandescent mantle business to all comers. The two courses open to the shareholders were to ratify the agreement with the Welsbach Company or to provide further capital for the carrying on of their own business; and, under these circumstances, it is hardly matter for surprise that they decided to part with their undertaking on the terms proposed. The result is that all the outstanding actions between the rival Companies (Mr. Duncan believed there were eleven) will be dismissed. What golden opportunities are thus lost to the lawyers! Mr. Duncan thought that after this amalgamation the Welsbach Company would have nothing to fear from other rivals, "but would easily "beat anyone who came into the field." Time may prove this view to be correct; but it does not seem to us to be by any means certain that the Law Courts will not again be called upon to decide questions in regard to incandescent gas patents.

Washing-Up!

So the New Australia community broke down because nobody would consent to do the washing-up! This was the curious bit of news which last week arrested the attention of many newspaper readers, and took their thoughts for a moment from khaki and China. It was announced that the community in question—one of the numerous Collectivist experiments, one may reasonably suppose, which have been tried only to fail in all parts of the world—had nothing to complain of as regards site, or climate, or means of subsistence. But the washing-up was the rock on which the ship of the new State actually split. It is the great bottom difficulty of human society. It underlies the domestic-servant question, the question of elementary education, and all other social questions. Mr. George Griffith complained in a newspaper the other day that the money spent by the London School Board is worse than wasted; and the Duke of Devonshire said last week that the dislike of farmers to what is called "education" in the country is not wholly irrational. The doctrinaire view of elementary education is that it is an elevating influence. But when this elevation goes just far enough to make boys and girls despise honest work and feel "above" their fathers and mothers, practical-minded persons may well ask whether it is a good thing in the main. It is the artificial connection that has been established between schooling and getting on in the world which is one of the reasons for dissatisfaction with the present working of the Elementary Education Act; and the failure to adapt the school system scientifically to the true needs of the population is another. So the country spends many millions in fostering a distaste for washing-up. Yet there is always washing-up to be done; and who is to do it? All communities cannot avoid the difficulty by breaking up and going away. We shall all be dwellers in the New Australia by-and-by. Gas-stoves are a great boon in the kitchen; but, unfortunately, they themselves need an occasional washing-up, which they do not often get. The state in which these articles return from hire is a striking commentary on the superficiality of our boasted sanitary civilization. People are lashed into fury over the idea of an extra microbe in the town's water, which they never drink if they can get anything else; while if they could take a census of the bacterial population of their own kitchen, the revelation would be something worth notice.

WATER AND SANITARY AFFAIRS.

It is an unfortunate circumstance that the expressions of gratification in which we indulged in the last number of the "Journal," at the absence of complaints in regard to the supply of water in the Metropolis, cannot be emphasized this week by repetition. Almost simultaneously with the appearance of those remarks, an apology was offered in the London papers, by the Secretary of the Lambeth Water Company, for a short supply in their district, and an appeal made to consumers to exercise economy in the use of water. Upper Tooting was the locality most seriously affected. The intense heat caused such an abnormal demand upon the reservoir there, that towards the close of the week ending the 21st inst. the pressure failed altogether. The measures resorted to by the Company of shutting off at intervals the supply to the low-lying parts of the district for the benefit of the higher portions—inconvenient, as they no doubt were, to many of the consumers—would have had the effect of more equally distributing the available supply of water, if a serious accident had not happened which disorganized the system. Last Sunday week, two mains burst, and then it was deemed advisable to explain the circumstances through the medium of the Press, and ask for the indulgence of the consumers. Meanwhile, efforts were made to minimize the inconvenience as far as possible by arranging for a service of water-carts to call several times daily at the houses in the district most seriously affected, and by promptly setting about repairing the damage. It was hoped that the usual supply would be restored by last Sunday. It is scarcely necessary to say that some of the papers did not fail to make a good deal out of this lapse on the part of the Company—opening their columns freely to the complaints of "disgusted" and "indignant" consumers. It is certainly remarkable that a few days of unusually hot weather, but by no means a period of drought, should have put such a strain on the resources of a London Water Company as to cause a breakdown. It is one of those "regrettable incidents" which naturally evoke hostile criticism, whether they occur in the conduct of a water undertaking or of a campaign, and give rise to demands for change of administration.

Fortunately, London has not suffered from a short supply of water so much as Paris, where the hot weather has threatened the city with a water famine. A fortnight ago the public were informed by the municipal authorities that the greatest possible care would have to be exercised to prevent waste; and on the 22nd inst. the water was shut off from eleven at night till six in the morning. The consumption during the period of the heat-wave was far greater than had ever been experienced; and, curiously enough, it was higher at night than in the daytime. This is attributable partly to the quantity of glass-washing done in the restaurants after eleven o'clock, and largely to the custom prevalent among the residents of letting the water run all night over bottles of wine, milk, or water, to keep them cool. The bakers have been unable to carry on their work owing to the water being cut off; and it has not been possible to operate the hydraulic lifts. Worse than all, there has been no water available for fire extinction; and, according to the "Matin," a house on the Boulevard de Belleville was recently burned down from this cause, while the firemen stood looking on. It was understood a few months ago that the Municipality had made special arrangements for the supply of the city during the period of the exhibition, when there would necessarily be a large influx of visitors. They must have sadly miscalculated the extent of the demands, or the present scarcity would not have arisen. It is rumoured,

however, that it has been brought about not so much by the increased consumption—though this is responsible to a large extent—as by the use of filtered water for street-sprinkling and industrial purposes. The efforts of the Municipal Engineers are now being directed to replenishing the reservoirs which have been so heavily drawn upon; and the stoppage of the supply during the night hours has already increased the store. As with us, when trouble arises in connection with the water service, people begin to talk of the advisability of going to a distant source for an additional supply; and consequently a suggestion has been again made to bring water to Paris by gravitation from the Lake of Geneva. But there are political difficulties in the way.

Although the report of the "Lancet" Commission, of which an epitome is given in another part of the "JOURNAL," does not add much to the stock of knowledge upon the Metropolitan Water Question, it is a valuable document from the fact that it embodies conclusions, arrived at by independent inquirers, similar to some of those come to by the last Royal Commission. The "Lancet" investigators think that more power to control the London Water Companies should be conferred upon the Water Examiner. Lord Llandaff's Commission were precisely of this opinion; and there were other matters, such as the prevention of waste, the regulation of fittings, &c., in respect of which they considered that more control might be exercised, whether the water undertakings remained in, or were taken out of, the present hands. As far as the Water Examiner is concerned, the proposal of both Commissions is that he should be able to do as of right what he now does only by courtesy. We do not suppose the Water Companies would raise any great objection to the Examiner being invested with such additional powers as might be deemed necessary to safeguard the public health; but we doubt whether the Government will consider the existing arrangements affecting him as well as the Official Auditor so inadequate as to call for special treatment apart from the general question, which, it seems to us, will have to be taken up sooner or later—by them or by their successors.

The Gas Examinerships of the London County Council.—Mr. J. Wade, the Gas Examiner at the Wellclose Square testing-place, will resign this position on the 30th of September next; and the Council have lost by death Mr. A. H. Boylan, the Examiner at Lewisham. Mr. A. W. Mitchell has succeeded Mr. Boylan; Mr. J. F. H. Gilbard will be transferred from Old Ford to Wellclose Square; and Mr. Martin Priest will take charge of the Old Ford station as from the 1st of October.

Manchester and District Junior Gas Association.—Some of the members of the above Association paid a visit to the Thorncliffe Iron-Works of Messrs. Newton, Chambers, and Co., last Saturday, where they were accorded a most hearty welcome by Mr. G. Dawson, the Managing-Director. The visitors were then conducted round the works by Mr. Froggatt and Mr. Goddard, who explained the work in hand in the different departments, from the metal in the rough to the finished article. Mr. Dawson then kindly invited the members to lunch, which was provided at the Midland Hotel, Chapeltown. At its close, Mr. R. H. Garlick, the President of the Association, proposed a vote of thanks to Mr. Dawson, Mr. Froggatt, and Mr. Goddard, for the courteous way they had received and entertained the members. Mr. Froggatt, in reply, gave an interesting account of the life of the firm and the work they turn out.

The Prize Winners at the City and Guilds Examinations.—We have received from Sir Philip Magnus the list of prize winners in the last technological examinations of the City and Guilds of London Institute. The following are the names of the successful students in "Gas Manufacture:" Honours Grade—First prize (£2 and a silver medal), A. W. Hoggard; second prize (£2 and first-class certificate), D. J. Winslow. Ordinary Grade—First prize (£1, a silver medal, and first-class certificate), J. Holland; second prize (£1, a bronze medal, and first-class certificate), J. S. Thorman; third prize (bronze medal), F. V. Barnes. Three of the prize winners—Messrs. Holland, Thorman, and Winslow—were students at the Regent Street Polytechnic, where Mr. Winslow gained the silver medal in the Honours Grade with 88 per cent. of marks, and Mr. Holland a certificate and 5s. in books in the Ordinary Grade. It must be highly gratifying to Mr. Walter Grafton, F.C.S., the conductor of the classes in "Gas Manufacture" at that institution, to find that 25 per cent. of the candidates who passed first-class, and a like percentage who passed second-class, in the Honours Grade at the last City and Guilds examinations were students there; while in the Ordinary Grade the percentages were 30 in the first and 17 in the second class. Among the prize winners in other subjects, we notice that Mr. John Power, Assistant to Mr. C. Taylor, till recently Engineer to the Derby Gas Company, obtained the first prize (£2 and a silver medal) in the Ordinary Grade of "Mechanical Engineering."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 308.)

THE Stock Exchange had nothing befall it last week to put a brighter complexion on the markets; and pretty well everything continued in its old torpid, depressed condition. The intense heat of the weather, too, was indisposing to enterprise. Business generally was very quiet; and the greatest degree of activity was to be found in the railway market, where the ever varying reports from day to day of the chances of a Great Eastern strike were welcomed by bulls or by bears according to their tenor. But outside of this department most things were quite colouriess; and in the absence of any important intelligence from China or South Africa, they remained in an attitude of expectation. Taken all round, prices have moved very slightly and also with a considerable degree of irregularity. In the Money Market, the tone was sharper. There was a good demand for the purposes of the Stock Exchange settlement; and discount rates were very firm. Business in the Gas Market was exceptionally quiet; even more so than can be accounted for by the near approach of the holiday season. Certainly it would appear that the present is not the time to sell gas stocks; and none but those who are absolutely compelled to realize should do so. The offer of a bit of stock in the market seems to be the signal for dropping the quotation to what is in some cases an unreasonably low figure. The general rise in the price of gas means reduced dividends; but it cannot be for long. Already there are indications of a turn in the coal market which alone is responsible for dearer gas. Besides this, the half-yearly accounts to hand show that the demand for gas continues to increase, and that the last half year has been a good one. Therefore let shareholders hold on tight to their scrip, and at no distant date they may be looking back with a smile at the clouds that have rolled away. During the week there were a few transactions in Gaslight issues at good steady figures; the ordinary opening and closing at about 98½, and quotations being unchanged. South Metropolitan was hardly touched until just towards the close, and did not vary. But the debenture fell a point. A bargain at a low figure depressed Commercial old; but subsequent dealings commanded a higher price. Further attacks were made on Suburban and Provincial quotations; and Brighton, Crystal Palace, and Tottenham gave way. Among the Foreign undertakings, Continental Union alone changed. The Water Companies showed great weakness; and there were one or two sharp falls.

The daily operations were too small for detailed notice. The following reductions in quotation occurred: On Monday, Continental Union 2. In Water, Chelsea 5⅛ and Lambeth 5. On Tuesday, Commercial old 5. Southwark Water 2. On Wednesday, Crystal Palace 3. In Water, Chelsea 5 and Lambeth 2½. On Thursday, South Metropolitan debenture 1. New River 3. On Friday, Brighton "A" and Tottenham "B," 5 each. New River 2.

ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of Small Towns—The Second Period of Municipa Enterprise—The Leaky Capital Account—Depreciation or Life Insurance.

A SUBJECT that greatly interests and concerns electricians is the electric lighting of small towns. Papers on different aspects of the subject were recently read before the Municipal Electrical Association by Mr. C. S. Vesey Brown, of Lincoln, and Mr. G. M. Harris, of Bray. The papers were discussed by the Association, and also by the "Electrician." The core of the matter, of course, is the difficulty of making small electricity supply works pay. It is by this time recognized that small electric lighting companies do not pay, and that the only hope of escaping bankruptcy in their case lies in timely purchase by the local authority. One can say of this class of enterprises, without fear of contradiction, that even where they were not started with the overt or secret intention of passing them on at a premium to the local authority, there is not one in England the proprietors of which would not gladly sell at a discount now, if they could. The only chance there is now of starting new electricity supply undertakings in small towns is by winning over the local authority; and there are many consulting engineers of the genus tout who are still working this field for all it is worth. It is scarcely necessary to remark that, in the hands of these persuasive gentry, every electricity works estimate shows a handsome profit. But when the consultant has cleared his cheque and left the neighbourhood, disillusionment invariably comes in his stead.

The members of the Municipal Electrical Association know all about this second period of municipal electric lighting enterprise. Mr. Harris, for example, plainly says that small local authorities ought to be content if they can do their own public lighting at a reasonable cost, and provide those inhabitants of the district who like it with electric lighting at a fair price. "The measure of the success of such an undertaking should then be judged, not by actual return made in the shape of profit shown, but upon truly municipal lines—that is, by the efficiency and cost of the public lighting and the rate at which a supply of electricity is obtainable for private use." That is all right. Nobody would ever object to a local authority going into the trade with their eyes open, as Penzance and Ramsgate have done. The scandal is that they are

deceived from the first—led to deceive themselves, and wind up by deceiving the ratepayers. One of the freshest examples of this kind of municipal progress that has come under our notice is a place where an initial capital outlay of (say) £60,000 is to be increased to £100,000 at once; and then the district will not be half covered. This is the trouble of these small and scattered places. The mains have to be carried so far in order to pick up a decent amount of work for the central station. This sort of "extension" goes on from the very beginning, and the deluded, inexperienced town councillors fondly believe they are thereby enlarging their business, when the truth of the matter is they have a leak in the capital account. The touting electrician gets a local authority to say A—usually a very small *a*—and then while his mouth is yet open he is forced to say B. After a time, the ratepayers begin to use another letter of the alphabet; but by that period the electrical expert from London has packed his bag and departed in search of another job.

Mr. Harris observes that in these small places "the policy of laying the mains well in advance of the demand, though justified in wealthy areas, would not be so in small towns where the conditions are different." What the small local authority should be forewarned about, therefore, is the absolute necessity for their knowing precisely what to expect when they are invited to start electric lighting in a particular area. This is only as much as to say that they must possess a clear idea as to when their capital account will be closed. Of how many municipal undertakings can this knowledge be said to exist? An electric lighting company can easily see the length of their tether; but not a local authority, who begin with a false view of the possibilities of a local electric lighting business. Once such a body gets the smell of "profits" into its nose, it will go sniffing after them for years; and every sniff means cable extensions. Both Mr. Harris and the "Electrician" agree that at this time of day small towns would be well advised to wait until a big electric power company comes along and includes them in its area, rather than waste a large capital in establishing works of their own. But what is to become of the touting electrician, if all the towns are wise? Mr. C. S. Vesey Brown's paper on the same subject was written to order of the Council of the Association. He admits that on the capital sum of £406,175 which he ascertains to have been spent by fourteen local authorities in electric lighting of towns under 40,000 inhabitants, the ratepayers have to subsidize the earnings by the amount of the difference between the average profit of 4½ per cent. and whatever may be the actual cost of working the concerns.

This brings us to the gist of the whole matter, which is, what does it cost, on the capital outlay (whatever this may be), to run an electric lighting business on a sound financial basis? This is a universal question, capable of a general answer. We care not whether the particular example be Hastings—where the electric lighting party on the Council affect to dismiss our recent strictures on their finance as having been "somewhat disingenuously posted"—or Brighton, or anywhere else. Mr. Brown, who hails from Lincoln, says that a return of at least 5¾ per cent. is needed to pay 3 per cent. upon, and redeem, corporation electric lighting loans in 25 years. We take his figure. How much must be added to it, for depreciation—meaning the necessary charge for maintaining the investment in its pristine, profit-earning value as a going concern? That is the query which, as we told the Hastings people, they and all other municipal suppliers of electricity shirk. A Hastings newspaper reporter has interviewed somebody connected with the electric lighting undertaking on our statement of what is necessary in this regard; and all he got was a vague protest that Professor Smith's estimate of 2¾ per cent. for the depreciation of this class of property is a "theoretical figure." So are the rates charged for fire and life insurance. Seeing that municipal men do not seem to understand the meaning of the word depreciation, we will call it the premium for insuring the life of machinery and plant in use for business purposes. What is the tariff rate for this? That question is plain enough.

SOME CURIOUS TESTS OF THE AIR OF A ROOM.

Mr. Francis Jones, Chemistry Master in the Manchester Grammar School, has recently forwarded to us a pamphlet entitled "The Air of Rooms;" being an account of the results of an examination, made by himself, into "the effect produced on the air of rooms by the use of gas, coal, electric light, &c., for heating and lighting purposes." Our attention had previously been attracted to this research by a notice appearing in the "Manchester Guardian," which gave the cheerful intelligence that, according to Mr. Jones, the use of gas for heating or lighting "should be eschewed, so far as is possible, by all who wish to live in reasonably pure air." The newspaper went on to furnish some particulars of the dreadful results ascertained by Mr. Jones to be produced by the burning of gas in "rooms;" and we were naturally interested to learn whether these applied only to the burning of Manchester gas in its native air, or whether the consequences might be regarded as of general application. Accordingly, we have studied the original source of this information with an intensity of interest that almost deserves to be called morbid; for the "Journal," as its regular readers know, has given more attention to the study of aerial sanitation than almost any other technical periodical in English. We have followed the work of Carnelley and Haldane, in what may be called the criticism of house ventilation systems, and have only recently added an appreciation of the constructive work of Mr. T. W. Aldwinckle in this section of an architect's responsibilities. If anybody should take the trouble to go through the back volumes of the "Journal" for the past twenty years, he would find a large body of literature of the same character; so that in welcoming Mr. Jones as one of the newest workers in this not very thankful field, which is so commonly neglected by competent and trustworthy scientific labourers, we are not without some warrant of experience of the subject.

Mr. Jones approaches the matter as a Chemist. As such, one would expect him to exhibit the usual defects of his qualities; and we frankly confess that it was with a suspicion of this sort at the back of our mind that we took up his pamphlet. How far the suspicion was justified will appear in the course of this article. To begin with, Mr. Jones very properly sets out all that the fathers of modern chemistry knew about the chemical composition of air. They thought that air is of pretty much the same composition everywhere and always; but this is now known to be not the case. One of the normal components of air, carbon dioxide, without which our atmosphere would not be air at all, nor capable of discharging a good half of its duty in the scheme of things, has come to be regarded by chemists as an "impurity." Mr. Jones does not fall into so vulgar an error. He admits that good air, away from towns, contains 3 volumes of carbon dioxide in 10,000. It does not sound much. Chemists have been obliged to state the composition of the atmosphere in terms of 10,000 volumes, in order to avoid having to give the proportion of carbon dioxide in less than whole numbers. Chemists, however, who are chemists first and men of good sound practical judgment afterwards, never stop to draw their readers' attention to the extent of the scale on which these figures are spaced. Three parts in 10,000! What does it mean? The plants know; but they cannot speak.

Having obtained his datum of the irreducible minimum of the quantity of carbon dioxide in normal country air, Mr. Jones next states that he has found 4·526 parts of carbon dioxide per 10,000 in the atmosphere of central Manchester. Without pausing to show that the difference is in any respect material, he immediately proceeds to state that "indoors, the gases given off in respiration and by the burning of gas, candles, and lamps are not rapidly removed even by the best systems of ventilation, and in too many cases they accumulate to such a degree as to be injurious to health." Observe the *petitio principii* of the conclusion. How do we know at what point the proportion of carbon dioxide in air becomes of itself injurious to health? If it be granted that there is a point at which the natural consequences of the absence of adequate ventilation in the case of occupied, warmed, and lighted rooms become injurious to health, what is the nature of the danger, and to what should it be ascribed? As a matter of fact, it is not known what the hygienic meaning is of the chemist's determination of the proportion of carbon dioxide in air which is being breathed by human beings, apart from other considerations. It is a far cry from the shed of a mineral water factory in England to the Black Hole of Calcutta; yet, in all probability, there would not be found a significant discrepancy between the amount of carbon dioxide usually present, quite harmlessly, in the former and in the worst-ventilated enclosed space ever occupied for ordinary purposes by human beings.

Consequently, it is usual now to regard the proportion of carbon dioxide detected in a sample of air by the use of the ordinary method of chemical analysis as an indicator of the efficiency of the ventilation. This is a very different thing from valuing it as something "injurious to health" in itself, or even as indicating the existence of accompanying atmospheric components and conditions in the apartment from which the sample was taken. The difference is in the point of view. The point of view we prefer is that of the sanitarian, who starts with the assumption that a reasonable requirement in regard to ventilation is that every inmate of a room shall have a fresh air supply of 2000 to 3000 cubic feet per hour. The test for carbon dioxide will tell whether this requirement is being satisfied or not. The chemist has a different standpoint. In the person of Mr. Jones, he remarks that "some chemists maintain that the carbon dioxide in the air of rooms is uniformly distributed; others that the air near the floor is much purer than near the ceiling; some consider that the carbon dioxide in the air of a room ought not to exceed that in the outer air by more than two volumes in 10,000; others would only condemn air containing more than 19 volumes in 10,000 of air." Well might he remark that these asserted results are contradictory. But he himself runs a risk of mixing up two distinct issues—one of fact, the other of opinion. The question of the distribution of carbon dioxide in the air of rooms should be one of fact susceptible of experimental determination; that of the justification for the "condemnation" of air containing a certain proportion of carbon dioxide per 10,000 parts, is something which cannot be settled merely by what some chemists "consider" correct.

In view of the uncertainty prevailing even among chemists on these vital matters, and in view also of modern changes in methods of heating, lighting, and ventilation, Mr. Jones undertook an investigation of the question. It is significant of the Chemist that the first thing he wanted for his purpose was a

laboratory. He did not begin by investigating the conditions prevailing in a private dwelling house, or a school; but he procured the use of a small room in the most central part of Manchester, in which the experiments were conducted. "The air space of the room was 935 cubic feet, it had one fire-place, one window, and a ventilator at the roof, opposite the door. This ventilator measured 18 inches by 9 inches, and was always kept open." Not to be captious, it is necessary to interpose at this stage a query as to how far this "laboratory" represents an ordinary room, and therefore how far the results obtained may be regarded as of general applicability to all rooms. It is a very small apartment, to begin with, and was at the back of the building, where there was little circulation of air outside. The unscientific way in which the existence of an open ventilator "at the roof, opposite the door" is noted is remarkable. Nobody knows whether this hole acted as an inlet or an outlet, or even if it acted at all. There is no reason why any of the results obtained here should be regarded as applying to any other apartment, especially to one much larger, or even as strictly comparable among themselves. Thus the title of the pamphlet itself is a misnomer. It has nothing to say about the air of "rooms," in the plural, but only of one particular room, very much in the singular.

The very first result determined in respect to this "laboratory" would be queried by every expert in ventilation. After starting with the just proviso that, "in order to make the results comparable, the tests must be taken under similar conditions," Mr. Jones jumps to the statement that "in an ordinary room the best air is near the floor, it becomes less pure a few feet from the floor, and is most impure at the ceiling." Not one test is adduced, as having been made in an ordinary room, to prove this. We have already stated some objections to the acceptance of this little box of a laboratory as an ordinary room; but even if it were to be so taken, the following table is Mr. Jones's idea of similarly made and conclusive tests:—

	Position.	Morning.	Afternoon.	Evening.
Carbon dioxide in 10,000 vols. of air.	Floor	5·117	6·639	Not observed.
	Table	7·999	8·510	Not observed.
	Ceiling	Not observed	Not observed	10·985

Surely, these "not observeds" militate somewhat against the clearness of whatever proof is intended to be deduced from this table. Mr. Jones cannot be ignorant of the fact that ventilating engineers and architects do not by any means hold that the air of rooms is purest at the floor level. On the contrary, they mostly believe that extraction of foul air at this level, if possible by an open fireplace, is very desirable. This is especially held to be true of apartments of any size. Even if the rising heated air is extracted at the ceiling level also, the assumed necessity of floor-level extraction is never ignored. Obviously, therefore, the limited value of this starting determination of Mr. Jones is more certain than its degree of approximation to general truth. He had better make a fresh start, and ascertain from wider experience the usual distribution of carbon dioxide in the air of ordinary rooms.

In this laboratory, a series of experiments numbered from A to K was started last November twelvemonth. In the first set, tests of the amount of carbon dioxide and of the humidity of the air of the room were taken as a rule at three periods of each day—morning, afternoon, and evening. The morning experiments were made before the fire was lit, or any gas burnt. The room was lighted by an ordinary No. 4 flat-flame burner, assumed to be burning at the rate of 4 cubic feet per hour. It was also noted if the room had been occupied. That the apartment was somewhat "stuffy" is to be inferred from the circumstance that invariably the proportion of carbon dioxide in its air exceeded the outdoor average by about 3 parts in 10,000. Usually, after about 8 hours' respiration of one person in the room, with a coal fire burning and gas alight for an hour or two, the proportion of carbon dioxide taken at the table level went up to 20 parts in 10,000 or thereabouts. On one occasion the proportion went up to 48, starting at 9·5 parts in 10,000. This was on Dec. 15, the day being qualified as "fine and bright." Two days later, the weather mended. It became "foggy and dark," and the proportion of carbonic acid sank to 6·13 at the starting, rising to 16 after four hours of gaslight. This illustrates the beautiful irregularity of these figures. As a rule, indeed, when the weather was rated as fine and bright, the starting proportion of carbon dioxide was higher than when it was dull. Thus, on Dec. 21 there was a thick fog all day; and we all know what that means in Manchester. The carbon dioxide was less than 9 at starting, and went up to 28·6 at night; whereas two days later, the weather being frosty and bright, the proportion started at about 10, but did not get beyond 19 parts in 10,000. Curiously enough, no temperature observations were made; and thus a simple guide to the state of the ventilation is not forthcoming.

The next set of experiments was made with the substitution of electric light for gas. This reduced the supply of extra carbon dioxide to respiration; while the fire and the open ventilator co-operated so efficiently that the proportion did not get much beyond 11 per cent. Mr. Jones remarks that the humidity is about the same in the ten sets of experiments. Next he had a gas-fire, with gas-light; the result being that the air was much drier, and there was more carbon dioxide in the room. He opined from this that the ventilating effect of the chimney was diminished by the absence of the open fire. The actual proportion of carbon dioxide was not larger; but it rose with greater uniformity every day. When it came to putting a gas-cooker into the room, and turning on both oven and boiling burners, the result was nearly catastrophic. "No satisfactory determinations were made with both the oven and top burners in use, because the room became unbearably hot and suffocating, and it was impossible to remain in it." Just so. This result, in short, gives Mr. Jones's show entirely away.

For what do all his labours amount to, as regards telling us what we did not know before? He sets out with some pomp fourteen conclusions as based upon the results of this investigation; but they can all be summed up in the statement that, unless the ventilation is adequate, the occupation by human beings and the burning of lights and fires so that the products of combustion mingle with the air of a room increases the proportion of carbon dioxide in that atmosphere. And the smaller the room the more marked this effect is likely to be; until if you put too large a gas-kitchener into a box room and turn all the gas on you really will not be able to stay there! If this is not sheer pedantry, we should like to be made acquainted with a finer specimen of the demonstration of the truth of the obvious. Where did Mr. Jones think to arrive at, in this precious galley? We notice that the "Manchester Guardian" ignores the size and character of the room which only an open fire and electric light, with a good-sized hole near the top, kept decently sweet after an occupancy of seven or eight hours. The newspaper is sensible enough to express the wish that Mr. Jones had tried the effect of a common oil-lamp—it might have added, and of a candle or two, without the ventilating effect of a coal-fire. But this gleam of common sense is immediately obscured by the sapient observation that "it is easy to imagine the damage to health that must be caused by gas-stoves, which, as is too often the case, stand out in a kitchen with no flue at all; and when that is also the living room of the family, the gas cooking-stove is anything but the blessing to the poor which it is made out to be." In such cases, the "family" probably has enough wit to open the window and also the door, which performance was barred by the conditions of Mr. Jones's experiment.

No! One is reluctantly driven to conclude that here again the Chemist, clever enough in his way, has failed to carry his points, because he has endeavoured to fit every fact to laboratory conditions, instead of using the laboratory to reduce to order and method, if necessary, indications afforded by the actual experiences of every-day life. Of course, we all know that an electric incandescent light does not draw upon the oxygen of the apartment which it lights; and also that there is a limit to the number of people and of gas-burners that can be packed into an apartment 10 feet square, with door and window shut, without striking effects upon the character of the contained air. Has Mr. Jones told the world anything more than this? If he has, we will gladly give his contribution to the sum of human knowledge as great publicity as we now do to the statement that his pamphlet is useless, looked at from the point of view of the practical person who buys his gas for consumption in ordinary rooms under conditions from which common sense is not deliberately excluded.

THE GAS SUPPLY OF BOSTON (MASS.).

(*Continued from p.* 214.)

THE point reached at the close of the previous article was that at which, through the action of the Brookline Company in undertaking to supply the public lights in some of the districts of Boston (previously served by other Companies) at much lower prices than had ever been charged before, the price of gas in that city had been generally lowered, and the Bay State Company run by Mr. Addicks had been compelled to deflate its capital by three million dollars. We have now to trace—always, as we have said, by the aid of Mr. J. H. Gray's articles in the "Quarterly Journal of Economics"—the history of the gas supply of Boston through the period of competition so inaugurated, to the cessation of that competition, and down to the present conditions and relations of the several Companies.

The Bay State Companies did not submit without protest to the competition of the Brookline Company—necessitating, of course, the paralleling of many of their mains. They promptly appealed to the Gas Commission (who, however, were declared by the Attorney-General to have no jurisdiction in the matter), and then to the Board of Aldermen, whose consent, it was contended, was required before the Brookline Company could open the streets. The Aldermen agreed that their consent was so required; but all their resolutions to this effect were vetoed by the Mayor, by whose authority the Company had commenced the work of laying the duplicating mains. The point remained theoretically in dispute for years—until the Companies came to terms—but it was practically settled by the Brookline Company laying such mains as they required. The gainers by the dispute appear to have been the lawyers.

We have said that the zeal of the Mayor of Boston in 1893 (Mr. Matthews) on behalf of the gas consumer was due rather to political motives than to a disinterested concern for the public welfare. This is shown to have been the case by the fact that,

just before the expiration of his term of office, he accepted, at an annual salary of $25,000, the presidency of the Bay State Companies, against which his campaign had been directed. He, however, only held the position for two months. "It was said that the magic of his name disappeared after the Republican victory in the city election." The incident concerns the history of the Boston Gas Supply but little; we mention it merely as throwing some light upon American methods of conducting both politics and business.

The laying of parallel mains and the competition in the supply of gas lasted until the end of April, 1896, by which time some 200 miles of mains had been duplicated, and almost every better-class house had a double service. Over and above the cost of these unnecessary mains and services, large sums of money had been spent by the Companies in soliciting custom, giving away gas-stoves, advertising, fixing and refixing meters, and putting in and taking out services. As a natural result, dividends dwindled considerably, and would have done so still further, so far as the Brookline Company were concerned, had that Company not, as was subsequently reported by the Gas Commission, carried to capital more than $200,000 properly chargeable to revenue. Needless to add, the total capital employed in the supplying of Boston with gas was, under such circumstances, far higher than should have been the case.

The sequel to the period of competition was one of virtual, though not absolute, amalgamation; and the aim of the consolidators resolved itself into that of making the consumers pay interest on the whole of the duplicated capital that had, or was supposed to have, been spent during the era of competition. The financial expedients employed to this end equal in their ingenuity and tortuousness those resorted to by the Bay State schemers, in earlier years, for the purpose of obtaining dividends on their well-watered capital. The Brookline Company, in May, 1896, agreed to sell their interests to the Bay State Company; the sale to take effect at the end of six months. As a guarantee of willingness to complete the bargain, the Bay State Company allowed the Boston Gas Company (one of the Bay State group) to enter into a contract with the Brookline Company whereby the former agreed to purchase annually from the latter, at a price equal to that charged by the Brookline Company to the majority of their customers, sufficient gas "to enable the Brookline Company to maintain its plant, pay all its expenses of every sort and description, and then pay 10 per cent. dividend on its stock, 5 per cent. on all bonds [at that time] issued, 6 per cent. upon all existing indebtedness, and 4 per cent. upon all future indebtedness created for the extension of its manufacturing and distributing plants." The surplus profits of the Boston Company could, by this means, be used to pay interest and dividends on the inflated capital of the Brookline Company, as they had previously been made to pay interest on the over-capitalization of the Bay State Company.

Having got this very valuable contract assured, the Brookline Company evaded their obligation to sell themselves to the Bay State Company by the expedient of getting the latter—how, we are not told—thrown into the hands of a receiver; and then getting three of their own chief officials (Standard Oil magnates) appointed Trustees of the Bay State Company, with control over all the Boston Gas Companies—the whole of which (except the Brookline) had by this time come under the sway of the Bay State combination. The actual details of these transactions have never yet seen the light; and while Mr. Addicks is keeping up—Mr. Gray suggests merely *pro formâ*—a public agitation against the Trustees (whom he accuses of having taken forcible possession of the Bay State Companies, and of corrupting the Press to support their action), the stock and bond holders of those Companies are challenging in the Law Courts his right to assign their interests to the Trustees; it being insinuated that Mr. Addicks received consideration for his action in so doing.

The moving spirit in these transactions was a Mr. H. M. Whitney, the owner of some considerable bituminous coal mines in Canada, who had that year (1896) obtained from the Massachusetts Legislature an Act incorporating the Massachusetts Pipe-Line Gas Company. The avowed object of this measure was to enable the promoters to manufacture, and sell in Boston, coke-oven gas, which it was declared could be sold at much cheaper rates than either coal or water gas. The real object was to form a nucleus for the consolidation of all the Boston Gas Companies. The Legislature, however, so amended the Act—which is said to have cost the promoters from two to five hundred thousand dollars, for "educating the Legislature and moulding public opinion!'—that consolidation was only possible thereunder on a basis of 60 cent gas, which the promoters had no intention of supplying. The franchise, which included the right to sell gas to other Companies, was eventually assigned to a further newly-founded undertaking, the New England Gas and Coke Company.

This Company was formed by Mr. Whitney and his friends the Standard Oil magnates, in conjunction with Messrs. Emerson M'Millan and W. J. Elkins, "two of the best-known developers of gas plants and gas stocks in America." It is not an incorporated Company, but in fact a partnership, and therefore exempt from the restrictions imposed on corporate undertakings. "Both the financial and industrial operations of the Company are as free from State control of every kind as if they were carried on by a single individual;" and the only limit to the capital is the willingness of the public to subscribe. The Company are constructing, or have constructed, very large works; and the capital is $35,000,000.

The present situation is, therefore, that in the hands of Mr. Whitney and his friends are this New England Gas and Coke Company, and all the previously existing Boston Gas Companies; that the former has an enormous capital, while no one knows the value of the assets; that the latter are largely over-capitalized; that it will be sought to make the Boston consumers pay dividends on this mass of inflated capital; and that the Gas Commission appear to be unable to protect the consumers from such imposition. In the words of Mr. Gray: "The gas consumers of Boston, as the result of their supposed gains from the agitation of 1893, will have to face an increase of $35,000,000 or more of capital; and . . . the Companies are in such a situation now as to enable them to evade almost all the corporation laws of the State, and to nullify, or at least make very much more difficult than ever before, the attempts to control the gas industry in the public interest. . . . If the present unity of management be preserved, the Boston gas consumers must, until 1937 (when the Boston United Gas Bonds are paid off) pay dividends and interest on $47,169,900. This includes simply that portion of the total capitalization—of, perhaps, $160,000,000—which must have its reward in order to give no legal grounds for dissolving some of the Corporations or Trusts. . . . But even this minimum of more than $47,000,000 is probably something like four times the actual investment in the field, and more than five times the amount of capital the Gas Commission . . . will allow the Massachusetts Corporations to issue. If the maximum capitalization . . . be included, the nominal (amount) is $160,309,600, or more than seventeen times the amount necessary, in the judgment of the Commission, to supply the needs of the field."

Public opinion in Boston is much stirred by the existing state of affairs, but is not unanimous as to the remedy needed, nor as to the means of its application. We hope we have made a very complicated story sufficiently clear for the final outcome of the present difficulties and complications in which the supply of gas in Boston is involved, to be awaited by our readers with a considerable amount of interest.

UTILIZING THE WASTE HEAT FROM GAS-ENGINES.

In an article on the above subject which appears in the current number of the "Engineering Magazine," Mr. Alton D. Adams points out that, though exhaust steam is now generally employed for heating purposes with good results, but little seems to have been done in the way of utilizing the heat from gas-engines; and he thinks this is partly due to the forms in which that heat is available. He goes on to show that exhaust steam contains substantially all the heat that can be recovered from steam-engines; but that the gas-engine heat appears in large amounts under two forms—the jacket water and the exhaust gases—and the problem is as to how to save it for useful purposes. He is careful to emphasize the fact that whatever is done as to the distribution of heat must not seriously interfere with the operation or efficiency of the engines; and therefore the effects on the exhaust gases and jacket water should be carefully considered. One of the first and most important points to be decided is the amount of heat per hour, or the extent of radiating surface, or the space that may be heated from a gas-engine of given capacity, when working at full load.

Mr. Adams proceeds to say that the efficiency of gas-engines—that is, the ratio of delivered work to the fuel energy of the gas consumed—varies with their size and construction. Inspection of results from a large number of tests, however, seems to indicate that the efficiency and losses, based on the total calorific power of the consumed gas, may be fairly assumed as follows for engines of moderate capacity: Efficiency, 18 per cent.; losses by conduction and radiation of heat from the engine-frame, 5 per cent.; heat escaping in the exhaust gases, 37 per cent.; heat in the jacket water, 40 per cent. As one horse-power-hour of work is the equivalent of 2545 heat units, the assumed efficiency of 18 per cent. corresponds to an hourly development of 14,139 units at the engine for each horse power-hour of output. Of this amount of heat, 37 per cent., or 5231 heat units, escapes in the exhaust gases, and 40 per cent., or 5655 heat units, in the jacket water. The sum of these losses—10,886 heat units—represents the total heat added to the exhaust gases and jacket water per delivered horse-power-hour. About 150° Fahr. seems to be the present maximum temperature advisable for jacket water on leaving the cylinder. To raise water from 32° to 150° requires 118 heat units per pound, while 1028 units must be added to each pound of water at 150°, to change it into steam at atmospheric pressure. It therefore seems that only about one-tenth of the jacket water from a gas-engine can really be turned to steam by the entire heat in its exhaust gases, even if the whole of it can be extracted.

The author advises that in a hot-water heating system, operated from a gas-engine, the jacket water, after leaving the engine, should pass through pipes that are subject to the action of the exhaust gases. Leaving the gas-heated pipes, the hot-water supply should go to the radiators or other heating surface, and thence back to the water-jacket on the engine cylinder. He points out that the amount of heat that can be

extracted from the exhaust gases by the jacket water, with suitably proportioned heating surface, obviously depends to a large extent on their relative temperatures. There is much uncertainty about the temperature of a gas-engine exhaust, unless all the conditions of operation are known; but 1050° Fahr. seems to be a conservative estimate for an average case. Such a temperature should, he says, be selected for the water that leaves the gas-heated coils for the radiating surface, that it will reach the water-jacket at a certain point below 150°. The temperature of the water on entering the cylinder jacket should be such, at the maximum rate of flow through the system, that it will be 150° on leaving the jacket. If the exhaust gases are lowered from 1050° to 350°, they give up approximately two-thirds of their heat. As the total heat escaping in the exhaust was taken at 37 per cent. of the calorific power of the gas consumed in the engine, about two-thirds of this, or 24 per cent. of the heat of gas combustion, may be added to the jacket water under the conditions named. With 40 per cent. of the heat of combustion in the jacket water before it comes under the action of the exhaust, the contained heat of the water is raised to 64 per cent. of the total amount developed. Of the heat added to the jacket water by the gas-engine, the cylinder will supply 62 per cent., and the exhaust gases 38 per cent.

On the assumption that 14,139 heat units are developed at the gas-engine for each brake horse power delivered, the author finds that about 5655 of these pass into the jacket water He shows that practically the whole of this heat is available in a hot-water heating system, save the small amount necessary to raise the circulating water to the temperature of the building heated or to the temperature at which the water flows from the heating coils. Of the 5231 units that escape in the exhaust gas for each delivered horse-power-hour, 66 per cent., or 3452 heat units, representing 24 per cent. of the total amount developed, can be added to the jacket water after it leaves the cylinder. The total heat available for general purposes from a gas-engine, under the stated conditions, is therefore about $5655 + 3452 = 9107$ heat units per delivered horse-power-hour. One square foot of good radiating surface, when supplied with hot water from a gas-engine (the drop in temperature at the radiator being 40°), dissipates 150 heat units per hour in an atmosphere at 70°. For each horse power delivered by a gas-engine, about 60 square feet of direct radiating surface should be supplied. Allowing 10 heat units per hour for each cubic foot of space warmed as a rough approximation, 910 cubic feet may be heated for each horse power delivered by the engine. Mr. Adams says the heat from gas-engines may readily be applied to heating purposes by direct or indirect radiation or by the hot-air system.

In considering the amount of coal that may be saved by the use of the gas-engine exhaust, the author remarks that the heat developed by the perfect combustion of 1 lb. of coal may be taken at 13,000 heat units. The boilers of heating systems in buildings may be expected to deliver to steam and hot water hardly more than one-half of the possible heat from the coal, or 6500 heat units per pound of coal burned. As each horse-power-hour of operation by the gas-engine was found to deliver 9107 units to the circulating water, this amount of operation is equivalent in the heating system to $9107 \div 6500 = 1{\cdot}4$ lbs. of coal burned under the steam or hot-water boiler. In the case of a 100-horse power gas-engine operating the equivalent of 3000 hours at full load, or 300,000 horse-power-hours, the heat imparted by it to the circulating water would equal that from $300{,}000 \times 1{\cdot}4 = 420{,}000$ lbs. of coal. This coal, at $4 per short ton, has a value of $840, to say nothing of the labour necessary to operate the boiler and furnace where it is consumed.

Mr. Adams concludes by saying that so long as the gas-engine cylinder is kept within the desired temperature limits, the operation of the engine is obviously not affected by any use of the jacket water; so only the reaction of the heating system on the exhaust gases need be considered. In order to force the gas-engine exhaust through the bank of heating-coils in which the jacket water circulates, a light back-pressure must be set up in the engine cylinder. With properly-designed heating-coils, this back-pressure should, he thinks, be small, and thus increase the gas consumption but little. Assuming a mean effective pressure of 50 lbs. per square inch on the gas-engine piston, from the gas explosions, and 2 lbs. per square inch back-pressure, as a result of the heating-coils, there would be a loss of 4-horse power on the 100-horse engine. In order to bring the engine up to 100-horse power, the gas consumption must be increased by the equivalent of 4 (14,139) heat units per hour, by the assumption formerly made, or 81 cubic feet of gas, with 700 heat units per cubic foot. The value of this gas at $1 comes to exactly 8·1 c. But the heat delivered by the gas-engine to the hot-water system during one hour amounts to that from $1{\cdot}4 \times 100 = 140$ lbs. of coal under a heating boiler. At $4 per ton, the value of this coal is $(140 \times \$4 \div 2000)$ 28 c., or $3\frac{1}{2}$ times that of the gas. With gas for gas-engines produced on the premises, the advantage in favour of the heating system would necessarily be greater. The author thinks there is little doubt that the large amount of heat now wasted by gas-engines will gradually be applied to useful heating operations, as in the case of steam-engines.

At the forthcoming meeting of the British Association at Bradford, Mr. Thomas Fairley, of Leeds, will deal with the relationship between the heating and lighting power of coal gas.

MUNICIPAL GAS SUPPLIES IN GREAT BRITAIN.

The Committee on City Affairs of the Reform Club, New York, have been circularizing Gas Engineers in England, giving a list of 36 questions, dealing with the above subject, which they desire to have answered. A glance at the list (which is given below) will show how deeply the matter has been studied by the Committee, who claim that municipal trading ought to be encouraged, and not retarded. They also desire detailed information regarding the special conditions applicable in individual cases, and would like, as far as possible, to receive any reports and accounts recently issued, copies of the laws under which local supplies are carried on, and any other papers that will assist in giving an accurate idea of the details of various undertakings. It can hardly be hoped that any one Engineer would fully reply to the list of questions; but probably some of our readers would like to help by replying, at all events, to a portion of them. Answers should be addressed to the Secretary of the Special Committee (No. 52, William Street, New York).

1.—Is there competition between gas plants in British cities?
2.—Is it the policy of Parliament to authorize a company to supply an area when a company is already doing so?
3.—Is there any Act of Parliament or Standing Order of the House of Commons prohibiting competition?
4.—Can municipal corporations establish gas-works without purchasing those already existing?
5.—Has the Borough Funds Act of 1872 practically made this impossible?
6.—Is competition considered advisable?
7.—If a company refuses to sell its plant to the town, can the town compel it to do so?
8.—If so, under what conditions?
9.—Do the Private Bills now passed usually contain clauses regarding purchase by the public?
10.—What means have been used to prevent over-capitalization or the "watering" of stock, and the consequent evasion of the sliding-scale or the statutory limits upon dividends?
11.—How far have they been successful?
12.—Has the sliding-scale proved satisfactory?
13.—What, if any, are its disadvantages?
14.—Has the limit upon dividends retarded the development and progress of the gas industry?
15.—Is the method of control considered satisfactory?
16.—Are the limits usually reached?
17.—Are the limits fixed by General Acts, by Provisional Orders, or by Local Acts?
18.—Is the limit upon the price of gas charged by companies effective? Would they charge higher prices if there were no statutory limits?
19.—Are prices lower under municipal or under private operations?
20.—Are prepayment meters more generally adopted by municipalities or companies?
21.—Are prices for meters, fittings, &c., lower under municipal or under private operation?
22.—Is the quality of gas better under municipal or under private operation?
23.—Are wages higher under municipal or under private operation?
24.—Are hours of labour less under municipal or under private operation?
25.—Do labourers work as efficiently under municipal as under private operation?
26.—Do municipalities set aside sufficient funds for depreciation, renewal, and sinking funds?
27.—Does the requirement that loans be approved by the Local Government Board have a beneficial influence?
28.—Are municipal or private plants the more progressive and the quicker to adopt new inventions?
29.—Do municipal or private plants secure more gas from the same quality and quantity of coal?
30.—Do municipalities or companies get more from the sale of bye-products? Is there any difference in management on this score?
31.—About what proportion of the gross profits ("receipts" less "expenditures" in Board of Trade returns) are used in aid of rates, or placed to the credit of the borough fund?
32.—Is it the policy of the towns to make this account large?
33.—Why is it that since 1883 the ratio of public to private plants has not increased?
34.—Are franchises for limited periods or virtually perpetual?
35.—What is the method of valuing private works for the purpose of taxation?
36.—In the returns made annually to Parliament as to gas undertakings, is the ton used long or short?

PROCEEDINGS OF THE REGISTRAR OF FRIENDLY SOCIETIES UNDER THE WORKMEN'S COMPENSATION ACT.

The report of the Chief Registrar of Friendly Societies for the year 1899—published, we note, some three months earlier this year than last, which is an example that might be followed with advantage in the case of other official reports—contains an account of the negotiations leading up to the certification, and a summary of the provisions, of a further sixteen mutual schemes adopted by employers and their hands under the Workmen's Compensation Act during the past year. These schemes include one applying to the employees of the Crown; the others were adopted by firms—chiefly collieries—employing somewhere about 10,000 workmen. The 55 schemes (reduced by the amalgamation of the Glamorganshire mines to 32) stated to have been certified in the Registrar's Report for 1898, included about 100,000 employees; so that the total number of workmen, other than Government employees, who had come to mutual agreements with their employers for the payment of accident compensation up to the end of last year, was somewhere about 110,000—not a large percentage of those who come within the scope of the Act of 1897.

In reference to the schemes certified during 1899, the Registrar observes that several were adopted by the virtually unanimous assent of employers and workmen; but that, even so, he, in one case at least, declined to grant a certificate until better terms than the workmen had stipulated for had been conceded—a pretty good indication of the thorough manner in which Mr. Brabrook fulfils the somewhat onerous—but to him congenial—duties of his position. He further remarks that in several cases ballots of the workmen were taken for or against the proposed scheme, but that the result was always inconclusive; for where the ballot was taken at the instance of the employer, the workmen, through their Trade Union, complained that it had been unfairly taken, and *vice versâ*, while in one case two ballots were taken with contradictory results. It is evident from the report that the Trade Unions have viewed such schemes with suspicion, and even hostility—a fact which is scarcely surprising to those who, like ourselves, hold that the adoption of mutual schemes tends to diminish the possibility of friction between employers and employed. In no case has a certificate been granted for a longer term than five years, at the end of which time the Registrar will be in a better position to judge as to whether the requirements of the law, that no scheme shall be less favourable to the workmen than the provisions of the Act, have been fulfilled.

For the purpose of affording information upon which to base such judgment, annual returns are required from the employers as to the working of the various schemes; and these returns for the year ended June 30, 1899, are appended to the Registrar's report. From the returns, it appears that, although the Act provides that "no scheme shall be certified which contains an obligation upon the workmen to join the scheme as a condition of their hiring," yet in 23 cases (including that of the South Metropolitan Gas Company) out of a total of 32, the whole, or practically the whole, of the workmen in the employment joined the scheme; while of the remainder, in only three cases was the proportion of workmen joining less than 90 per cent. of the whole. During the year, the 100,397 hands concerned contributed to the various funds £30,220, or 1·4d. per man per week; and the employers £40,676, equal to 1·9d. per man per week. The payments on account of deaths amounted to £7867, for incapacity to £31,197, and for other benefits to £5327. The number of deaths resulting from injury was 102; and in 74 cases dependants were left, to nearly all of whom pensions were awarded, in addition to the sums payable on death. The number of cases of incapacitation from injury was 14,165, and the average duration of such incapacity was three weeks two days; the average weekly allowance being 13s. The cases in which the duration of incapacity was two weeks and under were more than half of the whole number.

The Registrar remarks that, "taking into account (*a*) the other benefits, (*b*) the payments during the first two weeks of incapacity, (*c*) the subsequent payments in excess of those provided by the Act, and (*d*) the increase of funds (£24,436), it would appear that in the aggregate the workmen derive from these schemes benefits considerably exceeding the amount of their contributions. The circumstance that the common interest of the employer and the workmen in the success of a scheme is in favour of that vigilance which would tend to diminish the number and severity of accidents, and the fact that there has been an absence of litigation in the settlement of claims, are also justly to be considered as advantages offered by the schemes."

The following are some of the particulars contained in the return made by the South Metropolitan Gas Company, which will be of considerable interest to our readers. The income of the fund for the year comprised £864 from the Company and £380 from the workmen; while the outgoings included £22 on account of the death of one man, who left a widow as his only dependant; £854 for incapacity allowances; and £361 for "other benefits," including pensions to widows of men accidentally killed in previous years. The surplus on the year's working was therefore only £7. Of the 260 non-fatal cases of incapacitation by injury, 129—or about one-half—were of only two weeks or less duration. Of the remainder, 65 were over two and not over four weeks, 25 over four and not over six weeks, 19 over six and not over eight weeks, and 22 over eight weeks (4 cases extending beyond six months). The amount paid for cases of two weeks and under, and for which therefore the Company would not have been liable under the Act, was £105; while about £215 of the remaining £749 paid for accident allowances was in respect of the first fortnight's disability—making a total of £320 paid for periods not covered by the provisions of the Act. This, of itself, is practically equal to the amount contributed by the men. The average weekly payment during all cases of incapacity equalled 16s. 9d. As already stated, there was only one case of fatal injury.

THE "LANCET" ON THE METROPOLITAN WATER SUPPLY.

If the water supply of the Metropolis is not, within the next few years, settled upon a basis which will be satisfactory to everybody concerned, it will certainly not be because the subject has been insufficiently investigated. During the past ten years it has occupied two Royal Commissions, and, in one shape or another, has been inquired into by Parliamentary Committees and Inspectors of the Local Government Board; while a tribunal has been appointed to hear and deal with the grievances, real or supposed, of water consumers. As though all this were insufficient, our contemporary the "Lancet" must needs appoint a Commission of its own to look into the question; and their report, which was briefly noticed in the "Journal" last week, appears in the number for the 21st inst. It deals at some length with the question of control; but we do not see that the conclusions arrived at are of so much more importance than those contained in the report of Lord Llandaff's Commission as to compensate for the expense incurred in arriving at them. Put shortly, the "Lancet" Commission consider that the matters of greatest urgency in respect to the control of the London Water Companies relate to the duties of the Official Auditor and the Water Examiner; and, as far as the latter official is concerned, they think that, in view of the recommendations of both the Balfour and Llandaff Commissions, the Government have no legitimate reason for delay in passing a simple measure to carry them out. This being the conclusion come to by the "Lancet" investigators, it may be of interest to indicate the nature of the inquiry which led them to it, as shown by their report. This is divided into three parts. In the first, they deal with the history and definition of control; in the second, they review the existing statutory provisions for it; and in the third, they offer recommendations and suggestions for further control.

In their introductory remarks, the Commissioners point out that within the past few years two of the London Water Companies have failed to furnish their customers with an adequate supply of water; and they go on to say that the fact that certain parts of London were imperfectly served, has brought into prominence the whole question of the Metropolitan Water Supply as it at present exists. But they hold the opinion that, in the case of a rapidly spreading city like London, a knowledge of present requirements merely is not sufficient; it is necessary to look to the future. They sketch what they consider would be an ideal supply of water for London. They say "the quality of the water should be pure, and derived from sources beyond the suspicion of pollution; and the quantity should be adequate, not only for domestic supplies, but sufficient to give an unstinted amount for municipal purposes." The public fountains should not be allowed to run dry, the ornamental waters should be clear and bright, and the whole flow of the Thames and Lea should be allowed to pass down to cleanse and scour the lower reaches of the river. The Commissioners evidently do not think this condition of things would be ensured by going to Wales, because they say that "a scheme which would give such results has yet to be devised;" and they realize the fact that if it were devised it would take many years to carry out. The question as to whether the people of London should obtain their supply of drinking water from some pure source at a distance is, they consider, not likely to be settled until the extent of the present sources of supply is definitely known; and, notwithstanding all that has been said, we are told that we are not yet in possession of "complete and accurate information on this matter." The Commissioners do not regard the results of the inquiries by Lord Balfour and Viscount Llandaff as thoroughly satisfactory. They say the report of the Commission presided over by the former is not "entirely reliable" on the subject of the available quantity of water; while "a careful study of the Llandaff report throws great doubt on the financial expediency of purchase," even if the Thames and Lea are equal to yielding a sufficient supply. As to control by a Water Board, they think that considerable opposition would arise if any attempt were made by the Government to carry out the recommendation for the formation of such a body; and also that it would be waste of time for Parliament, in the present state of knowledge, to attempt any legislation dealing financially with the water supply of London. The Commissioners are careful to point out that it by no means follows that nothing should be done. On the contrary, they express the opinion that information which is at present lacking should be collected and carefully considered before any decision is arrived at as to the future sources of water for London,

This information, they think, is only obtainable by instituting additional measures of control over the Companies.

The Commissioners next proceed to deal in detail with the existing statutory provisions for control. They discuss the obligations of the Companies to lay mains and provide and supply water for domestic purposes, and review the measures of control now exercised by the Local Government Board in respect of the quality and quantity of water to be supplied and of the financial proceedings of the Companies. This brings the Commissioners into touch with the Water Examiner and the Official Auditor. The provisions of the Metropolis Water Act, 1871, under which these officials are appointed and their duties defined, are given in full; and the rest of this chapter is devoted to a consideration of the Companies' powers in regard to the payment of dividends and the issue of new capital—the operation of the sinking-fund clause, now general in the Companies' Acts, being explained. This portion of the report does not call for further notice.

In their concluding chapter, the Commissioners set forth their recommendations and suggestions for further control. They deal first with the available sources of supply as submitted to Lord Balfour's Commission, and subsequently to Sir Joseph Pease's Committee in 1896; and they score a point in consequence of a discrepancy in the evidence given on behalf of the New River Company. Before the Commission, the Chadwell spring and wells were represented as capable of providing 34 million gallons of water daily; whereas before the Committee the quantity was put at 10 millions less—this allowance being said to be necessary for machinery not in use. Owing to this difference on the wrong side, the "Lancet" Commission consider they are justified in characterizing as "worthless" the conclusions arrived at by Lord Balfour's Commission on the quantity of water available; and they say no more about them. With regard to quality, they point out that the Commission recommended that greater power should be placed in the hands of the Water Examiner, and that regulations should be made with respect to the filtration of water. Another recommendation was that the Companies should be obliged to give accurate information as to the quantity of water pumped from their wells, and as to the height of water in them. The Balfour Commission offered two suggestions which they regarded as important factors in the consideration of the Metropolitan Water Question. They first recommended the extension of the jurisdiction of the Conservators of the Thames to all the tributary streams (which was done by the Act of 1896); and, next, the placing of the Water Examiner in such a position that he could exercise his authority in the direction of ensuring greater efficiency in the filtration of water.

The Commissioners now come to the long inquiry conducted by Lord Llandaff. After setting forth the terms of reference, they allude to the recommendation as to the intercommunication scheme, and commend the promptitude with which Parliament, in a case of emergency, passed a measure which was "undoubtedly for the public interest," and they trust this will encourage the Government to "deal without delay with the pressing needs of the people of London in regard to the water supply." Proceeding to review the recommendations of the report of Lord Llandaff's Commission, they dismiss as "impracticable at present" the proposal to establish a Water Board—the cases of Surrey and Kent being cited in justification of their conclusion. They point out that the Chairman of the Surrey County Council thought purchase of the water undertaking by any authority was undesirable; while purchase by the London County Council was, as far as Surrey was concerned, "the worst possible basis of settlement which could be arrived at." As to Kent, they think that if a water-bearing area were to be under the control of any authority other than the Council of the county, the interests of the people would be sacrificed to the wants of London. The suggestion made to Lord Llandaff's Commission was that the Kent Company's area should be left intact; and the "Lancet" thinks this would be the best solution of the problem as far as that county is concerned.

Coming to the question of the control recommended by the Balfour and Llandaff Commissions, the "Lancet" investigators consider that the things of greatest urgency may best be discussed under the headings of financial and general control. They acknowledge that the former is now in many respects satisfactory. Water-rents are not generally excessive; dividends are limited by Acts of Parliament; and fresh capital is subject to the sinking-fund clause. The unsatisfactory feature to their minds is that the Official Auditor occupies an anomalous position—being appointed by the Local Government Board and paid by the Water Companies, and having no power to incur expense for any legal advice he may require in the discharge of his duties. The Commissioners think this state of things should be altered without delay. They agree with Lord Llandaff and his colleagues that provision should be made for the Auditor to have Counsel's advice paid for by the Local Government Board; and they consider that he should also receive a liberal salary, which should not be paid by the Companies whose accounts he has to check in the public interest. The Water Examiner, too, occupies an equally anomalous position, inasmuch as, being a public official, he is paid out of the profits of private business, while the information which he furnishes to his Department is supplied to him by those who pay him. The "Lancet" Commissioners agree with the suggestion of Lord Balfour's Commission that a distinct obligation should be laid upon any company or local authority pumping water from the chalk for purposes of public supply to keep accurate observations of the effect of these operations on the level of the water in the wells, and return the results to the Water Examiner under regulations to be framed. The suggestions for control which were made by the late Water Examiner (Major-General Scott) during the sittings of the Llandaff Commission are given; and the report closes with the following suggestions:—

> The Auditor appointed by the Local Government Board should be in all respects an officer of that Board, and his salary should be paid from public sources. He should, when he wishes it, in the case of any difference with the Water Companies, have the advice and help of the Law Officers of the Crown.
>
> The Water Examiner appointed by the Local Government Board should have access to all parts of the Metropolitan Water Companies' undertakings. He should be entirely responsible for the report which he issues monthly. The Companies should be obliged to place at his disposal every facility for making the several investigations which he wishes. Every investigation which the Water Examiner makes should be done either by himself or by officers appointed by him. Any analyst he may employ should be nominated by himself, and all the necessary expenses entailed in carrying out the work necessary for him to give full and accurate information should be paid by the Government department.

The Commissioners think that no member of Parliament representing any part of Water London, whatever may be his political conviction, could fairly object to the measures of control indicated above; and any member for a Metropolitan constituency who failed to support the Government in passing a measure for the benefit of the whole of the water consumers, would, they consider, richly deserve to lose his seat at the next election. They add that, though the Metropolitan Water Supply is not, as pointed out by Mr. A. J. Balfour, an Imperial question, it is one of great importance to the people of London, and should not be treated as a party matter.

PERSONAL.

Mr. James Currie, Manager of the Inverkeithing Gas Company, has been appointed Manager of the Tranent Gas Company, in succession to Mr. J. Robertson.

Mr. J. Bruce, of Coupar Angus, has been selected out of 26 applicants for the position of Manager of the Lockerbie Corporation Gas-Works, in succession to Mr. Robert Young, who has obtained a similar appointment at Youghal.

Mr. W. A. Surridge has been appointed Chairman of the Herne Bay Gas Company, in succession to Mr. A. V. Newton, deceased; and Mr. P. A. Newton has been elected a Director of the Company in the place of his late father.

The interment of the late Mr. Edward Marfleet, the Secretary of the Newport (Mon.) Gas Company, whose sudden death was recorded in the "Journal" last week, took place on the 23rd inst. at Cambridge, from which city he went to Newport early in 1872.

Mr. W. J. Warner is about to tender his resignation as Engineer and Manager of the South Shields Gas Company—a position he has held since 1864; and it will be seen by an announcement which appears elsewhere that the Directors are inviting applications for the appointment.

It has been decided to invite the inhabitants of Stafford to subscribe to a fund for making a presentation to Mr. J. Ferguson Bell, who, during the seventeen years he held the position of Gas Engineer to the Corporation, made, both in public and private life, a large number of friends by his high character and his kindly disposition. The proposal is, we believe, being very cordially received. Mr. Bell yesterday took up his new appointment at Derby.

Mr. A. Horace Brookman, eldest son of Mr. Alfred H. Brookman, Engineer and Manager of the Tenby Gas-Works, has secured the appointment of Manager to the Pembroke Docks and Town Gas Company. Mr. Brookman has been Assistant to his father at Tenby during the past seven years. At a meeting of the Directors of the Tenby Gas Consumers' Company on the 25th inst., the Chairman (Mr. H. T. Smyth), referring to Mr. Brookman's resignation, expressed their regret at losing his services, but at the same time heartily congratulated him on his appointment, and wished him success in his new position.

Mr. A. Waddell, of Broughty Ferry, has been appointed Engineer and Manager to the Dunfermline Gas Commissioners, in succession to Mr. Hubert Pooley, who has been appointed to a similar post at Stafford. There were 38 applicants. Out of these a short leet was formed, consisting of the following: Mr. John W. Allin, Assistant-Engineer at St. Helens; Mr. J. H. Brearley, of Longwood; Mr. G. Keillor, of Peterhead; Mr. S. B. Langlands, of Coleraine; and Mr. A. Waddell, of Broughty Ferry. These were asked to meet the Commissioners last Friday. Mr. Brearley wrote that he had received a substantial increase to his salary, and had elected to remain. The other four attended, and were interviewed by the Commissioners. It was agreed to put to the vote only the names of Mr. Allin and Mr. Waddell. At the first vote, Mr. Waddell received the support of eleven out of eighteen members, and was thus elected. Mr. Waddell enters upon his new duties in a month. Mr. Pooley left Dunfermline yesterday (Monday). Mr. Waddell was a pupil of Mr. G. R. Hislop, of Paisley. He holds Government

certificates for chemistry and drawing. In 1885 he was appointed Manager of the Newtownards Corporation Gas-Works, and remained there till he was appointed to Broughty Ferry, in 1893. During his management at Newtownards, the price of gas was reduced from 7s. 6d. to 4s. 2d. per 1000 cubic feet; the works being, in the same period, very largely altered and extended to about double their capacity. Since he went to Broughty Ferry, the gas-works have been almost entirely reconstructed; and the price of gas has been reduced from 4s. 2d. to 2s. 11d. per 1000 cubic feet.

OBITUARY.

We regret to learn of the death in Bombay, on the 25th inst., from cholera, of Mr. Reginald Arthur Gandon, fifth son of Mr. Charles Gandon, M.Inst.C.E. Deceased, who was only 23 years of age, obtained early last year the appointment of Assistant-Engineer to the Bombay Gas Company.

Mr. George Auldjo Jamieson, a Chartered Accountant widely known in Scotland, head of the firm of Lindsay, Jamieson, and Haldane, C.A., of Edinburgh, died very suddenly in the New Club, Edinburgh, on the evening of Thursday, the 29th inst. His family having gone to the country, he dined at the Club, and was intending to travel to London that night. At the close of the dinner, however, he was seized with apoplexy, and died in two hours. Mr. Jamieson was a member of the Town Council of Edinburgh from 1889 onwards. It was his intention to retire from the Council in November. At a recent meeting, he asked to be allowed to address the Council, as he said, "for probably the last time," which it has proved to be in another sense than was intended. Mr. Jamieson was an unflinching opponent of the scheme for the transfer of the gas undertakings to the Corporations in 1887, in which capacity he came prominently before the public prior to his entering the Town Council.

The death has occurred at Edinburgh, with almost tragic suddenness, of Mr. James Wilson, M.Inst.C.E., the Engineer to the Edinburgh and District Water Trust. Mr. Wilson was trained in the office of Mr. James M. Gale, of the Glasgow Corporation Water Department, and was afterwards appointed Engineer and Superintendent of the Greenock Corporation Water Department. He served in that capacity for 25 years. On the death of Mr. Alexander Leslie, the head of the firm of Messrs. J. & A. Leslie and Reid, of Edinburgh, who had been for a long time the Engineer to the Edinburgh and District Water Trust, Mr. Reid became Engineer; and he took Mr. Wilson as partner. Mr. Reid only held the office for a few months, and on his death Mr. Wilson received the appointment of Engineer to the Trust. At that time the subject of the provision of an additional water supply was under the consideration of the Trustees. They had resolved upon impounding the waters of the Manor, a tributary of the Tweed; but on its being found that the supply was inadequate, the Trust fixed upon the Talla and other streams further up the Tweed as the new source. It was one of Mr. Wilson's first duties to prepare plans for the works connected with the additional supply. The works have been in progress for several years, under Mr. Wilson's supervision. The labour has been arduous, having been rendered more so by its being necessary to transfer one of the principal contracts from one firm to another. Mr. Wilson's health gave way under the strain, and he was allowed three months' leave. He returned from the South of France a few weeks ago, much improved in health. Last Friday week he went on a visit of inspection to the Talla works. When he returned on Saturday night, he appeared to be very much wearied; and sitting at tea he suddenly became unconscious. Medical aid was procured, but it was of no avail; and he passed peacefully away in little more than an hour. Mr. Wilson's advice was largely sought in matters relating to water supply. He was consulted by the Corporation of Belfast in their scheme for the compulsory purchase of the drainage area of their reservoir. He gave advice to the Falkirk and Larbert Water Trust in relation to their works at Little Denny. It was upon his advice that the Corporation of Stirling abandoned a proposal to provide the town with electricity generated by a turbine wheel driven by the town water. He advised the Corporation of Arbroath to adopt a gravitation scheme of water supply. The Corporation, instead, proceeded to develop a pumping scheme, which Mr. Wilson maintained, to the last, would be a failure. He was also one of the advisers of the opposition when the Highland water power scheme was before Parliament two sessions ago, and was rejected. Mr. Wilson's remains were interred at Greenock. He is survived by a widow, four sons, and one daughter.

NOTES.

Domestic Hot-Water Fitting.

The subject of domestic hot-water supply was brought before the recent summer meeting of the Institution of Heating and Ventilating Engineers, in a masterly paper, by Mr. Dye, which, with the discussion, is reported in the "Ironmonger" for July 14. It is safe to say that this important branch of household plumbing work is not well understood by people outside the trade. It is also an accessory of modern houses which has not usually been developed beyond the barest elements of the successful supply of one bath and two or three hot-water taps. Mr. Dye remarks himself that ordinarily a domestic hot-water circulating apparatus is considered sufficient if the boiler is capable, the hot-water reservoir (cylinder or tank) of proper size, and the piping arranged to secure a free and efficient circulation. This combination is not always found; but, in addition, there is one detail which is frequently neglected. This is the connection of the branches so that the taps shall yield the hottest water only, and all there is of it. It is quite common to find the branches so connected that it is impossible for hot water to flow out without at the same time cold water coming with it; and sometimes, after a little hot water has run, it will be followed by cool and cold water, although there may still remain a fair store of hot water in the reservoir. Mr. Dye explains how the best results may be attained, both with the tank and cylinder systems. He appears to favour a combination of these two systems, with both tank and cylinder of half the ordinary size, so as to share the work between them. In the course of the discussion, it was stated that the smallness of the pipes is a common cause of dissatisfaction with hot-water systems; and also that in large houses, where there are two baths and more than three or four hot-water taps, the usual kitchen range boiler is not powerful enough. Nobody mentioned independent gas-heated boilers in this connection.

Paints Upon Iron.

The oil and paint expert of the "Ironmonger," discoursing on the subject of paint upon iron, makes a point of the difference between the surface of wrought iron and that of castings. As is generally known, cast iron has a hard skin which it should be the care of the founder to preserve by giving the castings an early coat of priming, before rust has had time to attack the metal. On the other hand, wrought iron comes from the mill with a scale on its surface which should be cleaned off before painting. Some rolling mills are said to paint their output while it is yet warm; but the practice is regarded as a questionable one, as the mill-scale is underneath, and may come off. It would be useful to know the truth about this matter; because it is notorious that the perfect cleansing from scale of heavy rolled girders, and similar unhandy pieces, is rather a counsel of perfection. Between two risks, probably that of painting while yet warm from the rolls is to be preferred. It must be remembered in this connection that the substance of which mill-scale is chiefly composed—the black oxide of iron—is in itself a protective against rust. If the scale were always firmly adherent to the metal beneath, no painting at all would be necessary for the purpose of protection; but it is not so adhesive, after the piece has been exposed to the atmosphere for a time. The question, therefore, remains whether quick painting is not on the whole the best treatment for large rolled sections. It is remarked that, in dealing with ironwork, the utmost care should be exercised to use only a thoroughly good and pure linseed oil—Baltic oil for preference—as elasticity of the medium is of the first importance. Just now, when pure linseed oil is fetching nearly £35 a ton in the wholesale market, it is vain to expect to buy it under 3s. per gallon; and best Baltic oil will cost very much nearer 3s. 6d. This is another instance of the greatly enhanced value of all gas-works and engineering supplies.

Orde's Liquid Fuel Burners.

A good deal of attention is being devoted, at this time of dear coal, to the oil-firing of steamships. The idea, of course, is old; but this is precisely one of those engineering expedients which wax and wane in attractiveness for commercial, rather than technical, reasons. According to a contemporary, some exceptionally large oil-tank steamers are being fitted for burning liquid fuel upon a system devised by Mr. Orde, Chief Engineer to Messrs. Sir W. G. Armstrong, Whitworth, and Co. The principal feature of the novel arrangement consists in the preheating of the air, steam, and oil, which is pumped to the furnace. The injector also consists of a triplicate concentric set of tubes, whereof the inside one conveys the oil, the next carries the steam for atomizing it, and the outside tube is for the air which supports combustion. The oil-pipes are carried in spirals through the smoke-box of the boilers; and the ordinary furnaces are simply provided with a brick bridge 3 ft. 6 in. deep where the oil burns. The only air supply is that carried in by the injector; so that a high degree of regulation is possible. The steam for atomizing is superheated; and it is claimed that the work is done with a consumption of 3 per cent. of the steam generated. From a test of several hours' duration, it appears that perfect combustion of the oil took place; the smoke gases showing 13 per cent. of carbonic acid, with about 4 per cent. of oxygen. The evaporation of the boilers (Scotch marine type) was at the rate of about 15 lbs. per pound of water from and at 212° Fahr. Not the smallest gain by this method of firing steamship boilers is the supersession of ordinary stoking, so penible in tropical climates. It has hitherto been understood that the necessity of making up for the steam lost by the oil-injectors is the chief drawback to the use of liquid fuel at sea. It is stated, however, that, whereas this loss used to be as much as something like 10 or 15 per cent. of all the steam made, it is now, by Orde's system, reduced to not more than 3 per cent., which is certainly within reason.

TECHNICAL RECORD.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

The Thirty-ninth Annual Meeting of the above-named Association was held in the Freemasons' Hall, George Street, Edinburgh, last Thursday. Mr. W. EWING, of Hamilton, the President for the year, took the chair at eleven o'clock, at which time there was a large and representative gathering of members present.

DEPARTED MEMBERS.

The PRESIDENT said that since their last meeting they had lost by death three members of the Association—Mr. D. Bruce Peebles, of Leith; Mr. J. Robb, of Haddington; and Mr. Graham Ross, of Stonehaven. Mr. Peebles, they well knew, was a man of very inventive mind; and Mr. Robb was twice President of the Association.

THE COMMITTEE'S REPORT—METER-UNIONS.

The SECRETARY (Mr. R. S. Carlow, of Arbroath) read the annual report of the Committee. It set forth that the benevolent fund had been drawn upon to the extent of only £10 during the year; this sum having been paid to one deserving case. The Committee expressed their pleasure in submitting the following intimation received from the Secretary of the gas-meter makers: "The gas-meter makers have had several meetings with the view of arranging to supply interchangeable unions in Scotland, and are glad to be able to state that, on and after the 1st of January next, they hope to be able to supply them."

Mr. T. NAPIER MYERS (Saltcoats) asked if this would be an appropriate time to put a question with regard to the matter of meter-unions. He would like to know if what had just been announced was in line with what had been already recommended to them, or if there was still to be a difference between the screws put out by the different makers, because this would be introducing another thread. It would be out of the line of meters in use, and it would not be as had been recommended to them.

The SECRETARY said he could not give any information regarding screws or anything else. He only got the intimation into his possession two nights previously, with the following letter—

Milton House Works, Edinburgh, July 23, 1900.

My dear Sir,—In reply to your inquiry, I have been asked to acquaint you with the present position of matters; and it is hoped that the enclosed intimation will prove a satisfactory solution of the question, on the lines agreed upon a year ago.—Yours truly,

for Jas. Milne and Son, Limited,
D. MACFIE, Managing-Director.

About screws or threads there was no information whatever. They were to be "interchangeable unions;" but he could not give any details.

Mr. MYERS asked if it was expected that the Association would sanction or give its *imprimatur* to this proposal without knowing what was proposed, if the arrangement which was now suggested to be carried out was not in agreement with what they had already accepted and passed.

The PRESIDENT: It is only a proposal, so far as I understand; and it is optional whether we adopt it or not. We are not asked to adopt it.

The SECRETARY said if the meter makers had come to a decision among themselves that they were going to supply interchangeable unions, he did not consider that, in the meantime, they should interfere, because they might put the question just as far back as ever it was. He thought they should allow the matter to develop itself a little further before they interfered with it at all.

Mr. A. BELL (Dalkeith) said he thought what Mr. Myers wished to put was whether they were to understand that they were to have a special size of coupling for each meter. Their proposals were to restrict the number of couplings; three to five lights were to be one size, and five to ten lights another. He thought that what Mr. Myers meant was whether this was what was to be adopted, or whether it was simply to be an ordinary coupling, with a uniform thread. It was a great difficulty with them all that when they had to change from a three to a five light meter they were obliged to cut off the coupling, and put in a new one. In a small works, this was a great difficulty.

The SECRETARY said he thought that what the meter makers meant was that they proposed to supply couplings which were interchangeable; but he did not think they meant to adopt the standard couplings they had had before them. He had seen Mr. Macfie upon the subject, and what he gathered from that gentleman was that they had come to the decision that they would supply interchangeable couplings; but he gave no further information. They could shift any size of meter, either from a three to a five or from a five to a ten; they could take out the one and substitute another, either of the same or of a different maker.

Mr. MYERS suggested that inquiry might be made, and the result intimated in the afternoon.

This was agreed to; and it was subsequently announced that no further information had been obtained. Thereupon,

Mr. G. KEILLOR (Nairn) asked if they were to understand that the meter-makers were to make the unions so that they could attach a three-light for a two-light meter, a five-light for a ten-light, or a fifteen-light for a five-light. If that were so, it would be very much easier for everybody.

Mr. A. MACPHERSON (Kirkcaldy) said that so far as he knew, the whole of the meter-makers were to make their threads so that they could exchange a two-light by Milne for one by Alder and Mackay or Cowan, or any other maker. At present they could not; they must cut the coupling off, and re-solder the coupling. He understood that what the meter-makers had consented to do was to make all the couplings for the different sizes interchanageable, so that they would not require to cut the couplings off.

Mr. KEILLOR asked if it would not be better to make the two-light and the three-light couplings the same size.

Mr. MACPHERSON said that certainly was not the remit which was made by the Association, which, he thought, was to try to get the one size of meter to interchange with the same size of another maker; and he understood they were prepared to do this.

The HON. SECRETARY said that the meter makers did not commit themselves in any way in the meantime. It might be the couplings for a two-light and a three-light meter would be interchangeable; and he had no doubt that this was the intention of the meter makers, because he thought they were going very much on the lines suggested by the Association. But what they wished to avoid was giving out that they were to furnish any special coupling, belonging to any particular maker, or even to the Association. He thought the best thing they could do was to leave the matter in the hands of the Association in the meantime, till they would see what was proposed to be done by the meter makers. He had no doubt but that the matter would work out satisfactorily in the end.

The report of the Committee was adopted.

THE ROLL OF MEMBERSHIP.

The SECRETARY reported that the year was begun with 245 members; and resignation and death led to the removal of 18. There were applications from the following for admission to the Association:—

Ordinary Members.—Cunningham, A. M., Kilmalcolm; Duncan, J., Kirriemuir; Fairweather, W., Kilmarnock; O'Neill, T., Dunbar; Shiell, J., Moffat; Turner, J. S., Thurso; Young, W., Penicuik.

Associates.—Campbell, J., Dunfermline; Milne, S., Aberdeen; Robb, D. J., Hamilton; Keillor, J., Falkirk; Stevens, J. S., Renfrew.

THE AUDITOR'S REPORT.

Mr. R. B. MAIN (Glasgow), the Auditor, then presented his report upon the accounts of the Association for the past year. He said that a year ago he had the pleasure of submitting a very satisfactory financial statement; and he was glad to say that this year it was very much better. There was somewhere about £45 more in hand than they had twelve months ago. This, he thought, was exceedingly satisfactory. He hoped the funds would go on increasing. He had nothing really to do further than to bear testimony to the excellent manner in which Mr. Carlow looked after the books and accounts of the Association.

The funds of the Association amount to upwards of £400, of which the benevolent fund comes to over £230.

The PRESIDENT proposed a hearty vote of thanks to Mr. Main, which was carried, and duly acknowledged.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Kindly accept my sincere thanks for the honour you have conferred on me by appointing me to be Chairman of this Association. It was an honour I had never looked for; and, consequently, it came as a great surprise to me to find myself so exalted. Words cannot express my intense feelings of thankfulness for the courtesy and kindness shown to me during my term of office; and should my humble efforts have fallen short of your expectations, I trust you will overlook any shortcomings.

It is not my intention to trouble you with scientific details of gas manufacture, which is always much better left in the hands of such able and energetic experts as Professor Vivian Lewes, Mr. W. Young, and others who have contributed many valuable papers to the different Associations connected with gas manufacture, the outcome of many years' experiment and study.

The gas engineer of to-day has many more working details to consider in his efforts to make good and cheap gas, as compared with several years ago, and therefore cannot find the requisite time to carry on experiments to a successful issue. Hence the reason of the extraordinary value of these contributions which often give the gas engineer, who is always more or less a chemist, a firm basis to start off with practical experiment. Allow me to draw your attention to a valuable lecture delivered last May by Professor Lewes before the Institution of Gas Engineers, on "Water Gas and its Continental Developments," which gives us the key to cheap gas, notwithstanding the exorbitant price we are now paying for coal; and I have no doubt, from the excellent working results shown, that the future of gas manufacture is brighter than ever.

Gas companies and corporations have taken advantage of the rise in price of coal to increase the price of gas, and, I think, in

many instances unjustly. It is natural for gas companies to have their "pound of flesh;" but why should so many corporations show this bad example? In considering the rise in price of residuals, and the yearly increase in consumption, I must say that the financial vitality of a gas-works must be very low if it cannot meet a rise of 4s. or 5s. per ton in the price of coal, with everything else in its favour. Even the "second city of the Empire," which has advantages over us all, has shown the "white feather." Better to risk a slight deficit than stem the increase in consumption, which is the greatest source of profit of all gas-works. We are in the happy position of being able to reduce the price of gas—the present figure being 2s. 1d. per 1000 cubic feet—notwithstanding the fact that we are now paying 15s. 6d. and 15s. 9d. per ton for third-class coals which were formerly bought at less than half these prices.

Gas cookers and fires are still in great demand in Hamilton, and greatly appreciated by those who have them in use; and it is very comforting to find that our day consumption of gas is larger than that during the night. The consumption varies in the daytime from 45 to 75 per cent. of the total output, which is certainly a step in the right direction.

Prepayment meters have not boomed with us, owing to circumstances over which I have no control. There are about 400 in use; and the charge made is 2s. 6d. per 1000 cubic feet, being 5d. over the ordinary rate. My feeling is that we are nearing the time when cookers, heaters, prepayment meters, and incandescent burners will be given free to consumers. I have always been an advocate of this policy; and I have great confidence in saying that the tendency of the times is towards the universal adoption of incandescent lighting, and consequently a reduction of illuminating power by mixing coal and water gas, which will be generally used in a few years. The remarkably cheap incandescent burners now in the market are a great boon to gas consumers, and should surely reduce the complaints of bad gas often needlessly made by them.

Hamilton is often spoken of as the "Widnes of Scotland;" but, unfortunately, we have to work under much greater difficulties than that far-famed town, or any other town of a similar size in Scotland. For instance, take last year: (1) We lost nearly 20 million cubic feet as leakage or unaccounted-for gas, instead of from 6 to 8 millions, the amount for a well-conducted works of a similar size; the balance being due to subsidences caused by coal mining. (2) There are no railway facilities in the works; everything has to be carted at the rate of 9d. to 1s. 1d. per ton. (3) The tar and liquor is sold at a low figure instead of being manufactured into sulphate ammonia, &c., on the works, which would have increased our profit last year by about £1700. In all, the working loss is equal to £3200, or 7d. per 1000 cubic feet. Had these works been conducted under ordinary circumstances, the gas consumers of Hamilton should have been supplied with 23-candle gas at 1s. 6d. per 1000 cubic feet. This disadvantage has to be made up before we can claim to be on the same basis as other works of a similar size.

Local circumstances sometimes help the economy of gas manufacture; and I can confidently say that, given the same facilities, paying the same price for coal, and receiving the same price for residuals at Hamilton as in Widnes, it would be an easy matter for us to supply 18-candle gas at 10d. per 1000 cubic feet, and that with no differential rate to ordinary or prepayment meter consumers, and leaving a record profit at the end of the financial year.

It may be interesting to give a few figures relative to last year's working results, which I consider much behind our present work, as we are now in thorough working order: Coal carbonized, 13,236 tons; gas made, 132,400,000 cubic feet; tar and liquor, 871,111 gallons (liquor over 4° Twaddel); and coke and breeze saleable, 6327 tons. This gives 9½ cwt. of coke and breeze per ton of coal carbonized; and if we consider that cannel coal yields from 2 to 3 cwt. less coke per ton as compared with coking coal, you will not be surprised if I still advocate the simple, "unscientific generator" setting of retorts, at 150 per cent. less cost of construction, against the "scientific regenerative" setting, which so often disappoints and gives inferior results. I have yet to find the regenerative setting which can even bear comparison in yield per mouthpiece, durability, saving of fuel, easy working, and cost of construction with the simple generator adopted at Hamilton.

It has often struck me most forcibly that in most gas-works with elaborate systems of machinery and plant where we expect excellent working results and economical working in every department, the results are most disappointing. Instead of 4d. or 5d. per 1000 cubic feet for total salaries, wages, and collection, it is oftener double that figure. Our salaries, wages, and collection were 5½d. last year, owing to extraordinary work; but in the current year, I do not expect they will reach 4¾d. Of course, the extraordinary work caused by underground subsidences sometimes adds considerably to the wages bill. On more than one occasion I have had fifty men on streets searching for escapes.

It has often been said that our works are badly financed, and that we do not write off a fair proportion of our debt. In 1894, the loan capital was £15,350. Since then, there has been spent on ordinary and extraordinary extensions about £32,000; making a total of £47,350. The loan capital now stands at £35,550; showing a payment out of revenue since 1895 of £11,800. This is certainly more than ample, considering that we need only clear off our indebtedness once in forty years. Since extending the works, their market value has been enhanced by £100,000—a very sound financial position for any community to be in. By the end of this year, the consumption of gas will have trebled as compared with 1892.

For some time past, I have been experimenting with a new form of producer bar, which has given excellent results, and practically does away with the laborious work attending the clinkering of producers—in fact, so far as my experiment has gone, I have seen no clinker. The object of the new bar is to reduce labour to a minimum, save fuel, do away with clinker, and prevent an inrush of cold air while removing ash. It does all that admirably; but owing to it having been only a short time in use, I shall defer giving details of its construction until I am absolutely sure that I can recommend it.

The Corporation of Hamilton have been considering the erection of a sulphate of ammonia plant for several years; and even after deciding to erect a plant, objection was taken to it by adjoining proprietors and tenants on account of a possible nuisance. However, the erection of the plant was delayed, and during the interval we have found a patent plant which exactly suits the circumstances. The patentee is Mr. E. Scott, of London, whose success with plants of a similar kind is a guarantee of its success.

The following is a brief description of the plant: The apparatus differs from the plants commonly in use in many ways which give it advantages worthy the consideration of all interested in the economical production of sulphate of ammonia. Without going into details, I may say that the distillation of ammonia from gas liquor is effected under vacuum instead of under pressure, as is the case with the ordinary type of distilling plant. A great reduction of temperature of volatilization consequent on working under vacuum renders the use of steam under pressure quite unnecessary, and the exhaust steam from the pump obtaining the vacuum is all that is required to effect the distillation of the ammonia from the liquor; and this can be supplemented, when desired, by exhaust steam from any other convenient source. It will therefore be evident that a very great saving in fuel is effected by this plant. Another point which has received special attention is the utilization of the spent heat, and especially the heat evolved from the chemical combination of the ammonia with the acid, which is used to effect the distillation of a further quantity of liquor. The absence of all smell is also an important feature; and as the whole process is conducted entirely under vacuum, it is impossible that any noxious vapours can escape into the atmosphere. The waste liquors are discharged by the pump direct into the sewer or other receptacle at a very low temperature; thus avoiding any smell that might otherwise arise. This matter is of great importance in gas or chemical works surrounded by, or in close proximity to, dwelling-houses, as is frequently the case. It may be mentioned that there is only one pump attached to each apparatus; thus reducing the working parts to a minimum. The whole apparatus, which is very compact and of simple construction, commends itself as a most ingenious arrangement; and I have great hopes that it will be an acquisition to the gas and chemical professions.

Gentlemen, permit me to thank you for your patient hearing; and as we have a long programme of excellent quality before us, I trust we will get through it in the usual expeditious manner, at the same time doing justice to all concerned.

Mr. Hubert Pooley moved a hearty vote of thanks to the President for his most interesting address.

Mr. A. MacPherson (Kirkcaldy), in seconding the motion, remarked that the address was unique in the list of President's addresses. He thought it was perhaps fortunate for the President that it was not usual to discuss these productions, because there were in it certain passages which he might find somewhat severely handled.

The President returned thanks, and explained that he was unfortunately out of tune. The address was rattled through in about three hours; and he had left out some important details which would certainly have made it rather better in appearance. But time would not permit; and his head was not in working order for figures.

The Papers.

There was a list of four papers to be read at the meeting and these were dealt with in the following order: "The Construction and Working of Inclined Retorts." By Mr. W. R. Herring. "Automatic Meters: With a Comparison of Prices Charged. Slot *versus* Ordinary Consumers." By Mr. Thomas Lighbody. "Observations on Retorting and Condensing." By Mr. Forbes Waddell. "Jottings on Some of the Principles of Gas Manufacture, and their Practical Application." By Mr. William Young. In regard to Mr. Young's paper (which will be found in another part of this issue), it was, after some brief discussion, determined that, in the author's unavoidable absence from the meeting in consequence of ill-health, the communication should be taken as read, and included in the "Transactions" of the Association. The other papers submitted will be given, with a report of the discussion that took place, in a subsequent number of the "Journal."

Election of Office-Bearers.

The President announced that the ballot had resulted in the

following having been elected office-bearers for the coming year:—

President.—Mr. W. R. Herring, of Edinburgh.

Vice-Presidents.—Mr. Jas. Henderson, of Newton-on-Ayr; and Mr. John Wilson, of the Tradeston Gas-Works, Glasgow.

Hon. Secretary and Treasurer.—Mr. R. S. Carlow, of Arbroath.

Committee.—Mr. D. Vass, of Airdrie; Mr. D. Robertson, of Dunoon; Mr. W. Blair, of Helensburgh; and Mr. T. Carmichael, of Barrhead.

Auditor.—Mr. R. B. Main, of Glasgow.

NEXT PLACE OF MEETING.

The PRESIDENT intimated that the next place of meeting would be Glasgow, that city having been selected because of the Exhibition which is to be held there.

VOTES OF THANKS, &c.

The PRESIDENT said they had had excellent fare, in the way of papers. They had had one of the best programmes the Association had ever had; and he asked the members to accord a hearty vote of thanks to the gentlemen who had come forward that day, and who had taken so much trouble in the preparation of papers.

This was agreed to.

Mr. H. POOLEY presented Mr. Ewing with the President's Medal for the year. He himself should, he said, take away with him from Scotland his Presidential Medal, which he prized very much; and he was quite sure that Mr. Ewing would prize his equally. He knew he only expressed the wishes of every member of the Association, when he said he hoped that Mr. Ewing might be long spared to wear his medal.

The PRESIDENT thanked the Association with all sincerity for their kindness in presenting him with the medal, which he would certainly greatly prize. His term of office had been nothing but pleasure.

Mr. A. MACPHERSON proposed a vote of thanks to the Secretary. They all knew, he said, the extraordinary energy and enthusiasm Mr. Carlow threw into his duties.

Mr. CARLOW returned thanks, and said that the position of the Association was improving every year. He certainly should do his very utmost to make it this year a practical and a financial success.

This concluded the meeting.

In the evening, a large company of members and their friends—ladies and gentlemen—sat down to dinner in the Balmoral Hotel. Mr. Ewing presided. A brief toast-list was gone through, and a number of songs and recitations were given, which greatly contributed to the enjoyment of a very pleasant evening.

On Friday, a party of about 120 journeyed to Lanark, from whence they drove to the far-famed Falls of Clyde. The walk through the wood was a little oppressive, on account of the heat of the day. Apart from this slight drawback, it was most enjoyable. The Falls were seen to advantage. There was abundance of water; and the spectacle—the grim and rugged rocks standing out amidst the luxuriant greenery of bush and tree, the effect heightened by the glistening white of the roaring cascades—was viewed with delight by the thronging visitors. On returning to Lanark, luncheon was served in the Clydesdale Hotel. Several hours were thereafter at the disposal of the excursionists, in which to view the objects of interest in the ancient Royal Burgh and its neighbourhood. Tea was partaken of about 6 o'clock; and this was the closing proceeding of a meeting in which there had been nothing but happiness and good feeling from beginning to end. The excursionists travelled to and from either Edinburgh or Glasgow, as suited them. The weather during the day was bright and pleasant.

The North of England Gas Managers' Association and Workmen's Compensation, &c., Insurance.—Our readers may remember that just before the Workmen's Compensation Act came into force, about two years ago, the Committee of the above-named Association took steps to obtain a minimum rate of insurance for the North of England, and succeeded in securing a 9s. 6d. rate from a non-tariff office—the Ocean Accident and Guarantee Corporation, Limited—when tariff offices quoted twice this amount. In June last year the Committee succeeded in obtaining a reduced rate of 5s. from the office in question. They have again been recently approached by the Committee with the view to a further reduction; but they state that, judging from the extent of the claims they have had to meet, they are quite unable to make any abatement on the 5s. rate. In a circular on this subject issued by the Hon. Secretary of the Association (Mr. J. H. Penney, of South Shields), he remarks that many gas companies are now renewing their policies with the above-named Corporation at the 5s. rate, feeling that some consideration is due to them for meeting the Association so liberally at the outset, when other offices were charging very high rates. But as lower rates have now become somewhat general, the Committee are of opinion that the time has arrived when gas companies and local authorities in the district of the Association may very properly consider themselves free to make their own arrangements with any of the good offices now quoting; there being no longer any reason for the Association to intervene—the purpose for which they previously stepped in having been served.

PRINCIPLES INVOLVED IN THE PRODUCTION OF GAS BY DIFFERENT PROCESSES, AND THEIR RELATIVE VALUES.

By W. YOUNG.

[A Paper Presented to the North British Association of Gas Managers; Edinburgh Meeting, 1900.]

It is just twenty years ago that I had the pleasure of reading before you a paper on the principles involved in gas manufacture. I prefaced that paper by saying that the success of any manufacture depends very much upon the principles on which it is conducted; or, in other words, upon the correctness of the application of the physical, chemical, and mechanical laws which affect such manufacture. From time to time I had, I said, made jottings of matters which had occurred to me relating to the principles involved in gas manufacture; and believing that these jottings might be of some little value to the members of the Association—more particularly as pointing in the direction in which we were likely still further to improve our manufacture by the proper application of those principles to which I referred—I have, with the view of submitting them for your consideration, arranged and strung them together into something like consecutive order. The remarks I then made very closely describe my position before you to-day.

I.—USE OF COKE IN GAS MANUFACTURE.

At the date of my former paper, the sole purpose for which coke was used in the manufacture of gas was the heating of the retorts to effect the carbonization of the coal; and the first points then considered were the principles involved in the leading methods of utilizing the heat energy in the coke in order to heat the retorts. First, we had the method known as direct firing, which consisted in passing through the coke on the fire-grate the whole of the air necessary to oxidize the carbon of the coke completely and directly into carbon dioxide, and in utilizing the hot products of complete combustion as perfectly as possible in heating the retorts. Secondly, we had the generator and regenerative methods—deepening the bed of coke on the fire-grate, only admitting sufficient air to oxidize the carbon in the coke to the state of carbon monoxide, and completing the combustion of the carbon monoxide in the flue space around the retorts by means of a secondary supply of air preheated by the waste products of combustion on their way to the chimney.

Since that date, the use of coke in the manufacture of gas has been greatly extended by the introduction of the carburetted water-gas process. In this process, the heat energy of the coke is utilized in decomposing steam and hydrocarbon oil. A still later development in this direction has been brought under the notice of the gas industry by Mr. Carl Dellwik and by Professor Vivian B. Lewes; and in this the heat energy of the coke is still more effectively utilized for the manufacture of gas.

The principles of these respective processes are closely analogous to those of using the coke in heating the retorts; and although the purpose for which the heat energy of the coke is utilized, and the manner in which it is applied, are different, yet, as you are all conversant with both systems of heating retorts, these may, with advantage, be used to illustrate to you the newer processes for the utilization of coke in the manufacture of gas.

Use of Coke in Retort Firing.

The result of passing the whole of the air through the coke in the furnace during direct firing of the retorts, so as completely to burn the carbon necessary to heat the retorts into carbon dioxide, was, as you all know, to produce intense local heating in the furnace and adjacent brickwork. This caused both the brickwork and the ashes to clinker; making stoking difficult, and shortening the life of the retorts. Besides, there was great trouble in regulating the draught of air through the coke. At first, when the furnace was newly charged with coke and the fuel bed was deep, there was invariably less air than was necessary to burn the carbon of the coke to carbon dioxide. A part of the products remained as carbon monoxide, and a corresponding amount of energy was lost. On the other hand, on the layer of coke burning away, an excess of air passed through the fuel bed, and the excess nitrogen and oxygen of the air had to be heated up to the temperature of the furnace, and carried energy away with them which was entirely lost. It will thus be seen that, for the purpose of heating the retorts, both the principle and the practical application of direct firing were bad.

To overcome these defects, and more perfectly to utilize the heat energy of the coke, what are known as the generative and regenerative systems were introduced. Here we have the bed of coke on the fire-grate made much deeper, and kept at such a depth that the regulated current of air which is passed up through the coke is only sufficient to oxidize the carbon to the state of carbon monoxide; and to prevent local heating and fluxing where the air comes first into contact with the coke, a quantity of steam is mixed with the air, and the carbon monoxide and hydrogen thus produced are, as is well known, subsequently burned to carbonic acid and water vapour. This is done in the flues surrounding the retorts, by means of a secondary supply of air preheated to a high temperature. As there is no difficulty in keeping the bed of coke sufficiently deep to ensure that the regulated supply of air and steam shall combine with sufficient carbon to form carbon monoxide at all times, and as the volume of both the primary and secondary

air can be easily regulated so as to produce the exact quantity of carbon monoxide and subsequently to oxidize it completely to carbon dioxide, in order to supply the necessary heat to carbonize the coal, both the principles and the practical applicability of this method of utilizing the heat energy of the coke for the heating of the retorts are ideally perfect.

Retort Firing and Gas Making Compared.

The heating of retorts to carbonize coal by the combustion of the coke is, in a sense, a continuous process—that is to say, the heat is being continuously passed into the walls of the retorts. The manufacture of water gas or of carburetted water gas is an intermittent or alternating process. In this process, the heat from the combustion of the coke during the blow-up period is stored up in the contents of the apparatus, and is subsequently utilized in doing the useful work of decomposing water or oil. When the process is confined to the production of water gas alone, then the sole object aimed at during the blow-up period is to get as much as possible of the heat energy from the combustion of the coke localized and stored up in the coke which remains in the apparatus after the blow-up period. When, on the other hand, carburetted water gas is produced, the main object is still to get the heat of the combustion of the coke stored up in what remains; but a small part of the heat is required in order to decompose or crack-up the oil.

The Dellwik Process.

In the case of heating the retort by what is known as direct firing, we know that the result of passing the whole of the air through the coke bed, so as to burn the carbon into carbonic acid, was to produce intense local heating. Now, while that was a most objectionable condition of matters in the heating of gas-retorts, it is, as explained, the very condition desirable in the intermittent water-gas process, and is the very condition which Mr. Carl Dellwik has so successfully applied in his apparatus. He, as nearly as is practically possible, adjusts the thickness of the layer of carbon in his producer in accordance with the force of his air-blast, so that the carbon will be completely burned to carbon dioxide; and thus he concentrates the maximum possible quantity of heat in the remaining coke. The remaining coke is thus made available for the decomposition into water gas of the steam subsequently passed through it.

The principle of this process is sound; for whether the carbon is directly oxidized into carbon dioxide, or is first oxidized into carbon monoxide and subsequently further oxidized into carbon dioxide, the total number of heat units will be the same per pound of carbon consumed. The whole possible heat will be developed in the presence of the coke, and will be absorbed by it; and it will only be that remaining in the products of complete combustion which will pass away, either to be utilized for other purposes, such as raising steam or preheating steam prior to its being brought into contact with the hot coke, or simply to be blown into the air as is done in the Dellwik process.

In carrying such a principle into practical operation, there are, however, a number of difficulties which must be attended to, or otherwise there will be considerable loss. These difficulties are substantially identical with those experienced in the direct firing of retorts. Unless the quantity of air passed through the layer of coke in the producer is exactly adjusted to the thickness of the layer, so as to carry out the principle of completely oxidizing the carbon to carbon dioxide, there will be loss. If the air is in excess, there will be loss of heat, on account of that excess of air carrying away heat. If, on the other hand, the air is not in sufficient quantity, it does not matter whether the oxygen of the air unites with the carbon to form carbon dioxide or carbon monoxide first; a definite quantity of carbon monoxide will leave the surface of the coke in the producer exactly proportionate to the deficiency in the supply of air.

Now, in no published illustration of the apparatus for carrying out the Dellwik process is there any provision made for maintaining a uniform layer of coke. Coke, when charged into a producer by gravitation, tends to form a heap. The apex of this heap is at the point of delivery, and the heap falls away at the angle of rest; but as the angle of rest for large pieces is less than that for small, the large pieces of coke tend to roll to the tail of the heap in the producer. The tail of the heap of coke in the producer would therefore not only be the thinnest part of the layer, but would also be more open, on account of the larger pieces of coke. The strong air-blast would naturally pass at a greater rate through this thinner and more open part of the layer in the producer than through the deeper and denser part; and if the air-blast were just such as to pass through the open portions of the layer, neither carrying forward free oxygen nor carbon monoxide, then it is evident that the air passing through the deeper and closer part of the fuel bed would not be enough. The result would be the same whether we take it that carbon monoxide is first produced and subsequently oxidized to carbon dioxide, or that carbon dioxide is directly produced. In either event, the carbon dioxide would be reduced to carbon monoxide before it reached the surface of the coke towards the apex of the heap.

If the blast of air were increased, a portion would pass through the thinner and open part of the coke layer; carrying forward some free oxygen which might complete the oxidation of the carbon monoxide at the surface of the deeper part of the layer, and might still be, in part at least, used to heat the surface of the coke. If, however, the blast were still further increased, the corresponding portion of air would be in excess of that necessary to burn the carbon monoxide, and the peripheral excess of air would lead to waste. These practical difficulties would be accentuated by the intermittent method of charging up the producer.

We thus see that, however beautiful and perfect in principle the Dellwik process may be, it will be necessary, before that principle can be fully utilized, that some arrangement be provided for regulating the thickness and equalizing the openness of the bed of coke to suit the pressure of the air-blast.

Even allowing that a perfectly even bed of coke could be maintained, that during the blow-up period the combustion continued through the entire depth of coke, that the products leaving the surface of the coke are carbon dioxide and nitrogen, and that the whole bed of coke is thus raised to an even high temperature, still it is evident that the products of complete combustion must leave the surface of the bed of coke at a much higher temperature, and consequently carry away with them a larger amount of heat than would have been the case if the bed of coke had been deeper and the carbon dioxide had undergone the heat-absorbing process of being reduced to carbon monoxide. In the same way, in the heating of retorts by direct firing, the products left the surface of the coke at a much higher temperature than do the products from the surface of the coke contained in the generator in the generative and regenerative settings.

Then, again, the thickness of the bed of coke in the producer and the pressure of the blast of air being necessarily correlated with one another, it is evident that there is a limit to the thickness of the bed of coke. Beyond a certain point, the coke would not stand the blast, but would be lifted and carried away in the air-current. Evidence of this restriction in the thickness of the bed of coke is provided in the Dellwik process by the relative durations of the period of blowing up with air and that of gas producing from steam. The thinner the layer of coke that it is necessary to use in the Dellwik process in order to get the blast of air during the blow period to continue the combustion throughout the entire depth of fuel, so as to make it produce only carbon dioxide, the more inevitable it is that the products of combustion should leave the surface of the coke at an extremely high temperature, and the more necessary it becomes that the steam should be passed proportionately more slowly through the thinner bed of fuel, in order to ensure that the oxygen of the steam will, as far as possible, be combined with carbon to form carbon monoxide, and not carbon dioxide. There is no doubt that the relatively longer steaming period in the Dellwik process is due, in part at least, to these conditions.

Carburetted Water Gas.

In the carburetted water-gas process, the object is still to get the heat energy of the combustion of the carbon of the coke mainly concentrated in the coke remaining in the producer. The principle of the process is to use the energy of the heat of the coke chiefly in the production of water gas; using only a small part of the heat energy subsequently in order to crack up oils to carburet the gas. The relative proportion of the heat energy of the coke so utilized for each of these purposes, and the proportion which is lost, mainly depend upon the constitution of the products of combustion coming from the producer in which the coke is blown up by the blast of air. These products are subsequently used to heat up the brick checker work in the oil decomposing vessels. The proportions respectively utilized and lost also depend upon the constitution of the oils used as the carburetting agents. If the producer products contain much carbon monoxide, it cannot be all burned among the checker work, as it would overheat it, and a part is wasted. The quantity of carbon deposited upon the surface of the checker work is, with some oils, so great that its combustion alone would supply sufficient heat to decompose the carburetting oils.

To carry the principle of the carburetted water-gas process successfully into practical operation, it is essential that there be a due proportion between the combustion of the carbon into carbon dioxide in the producer and in the vessels containing the checker work respectively. It is also essential that the mass of coke in the producer, and that of the checker work in the decomposing vessels, should be able to store up the heat energy resulting from the combustion of the carbon in the respective vessels during the blow period, so as to enable these to do the work of decomposing the necessary quantities of water and of oil during the gas-making period.

Although the great mass of checker work affords considerable elasticity for variations in the relative amount of combustion of the carbon in the different vessels, since it has an equalizing action analogous to that of the fly-wheel in a heat-engine, yet, in practice, the principle of the process has hitherto been rarely attained. This is mainly due to the relative depth of coke in the producer and the pressure and volume of the blast not being adjusted, so as to bring about the due distribution of combustion of the carbon into carbon dioxide among the coke in the producer and amid the checker work in the decomposing chambers.

These defects in working are not, however, inherent in the principles of the process; and the erectors of the plant were quite aware of the advantages of consuming a proper proportion of the carbon into carbon dioxide in each compartment,

and were also aware that the proportions could be practically altered. In a paper read before the Incorporated Institution of Gas Engineers, in 1893, Mr. A. G. Glasgow said: "It is essential, therefore, that the apparatus be so designed that a perfect working balance is maintained between the demand for energy in the fixing chambers and that supplied by the generator when on blast, in spite of wide variations in the quality of fuel. This equilibrium involves, broadly speaking, a correct relation between the area and depth of generator fire and the blast pressures throughout the apparatus; and gradual development upon these lines has finally resulted in overcoming completely the waste due to the presence of carbonic oxide in the blast products."

In a table which accompanied that paper, Mr. Glasgow showed that upwards of 50 per cent. of the heat energy of the carbon is utilized in the production of the water gas. It would thus appear that the principle of the Dellwik process was largely applied in the carburetted water-gas process, and that Mr. Glasgow was aware that, by thinning the layer of coke and increasing the force of the blast, he could increase the amount of water gas produced per pound of carbon, and could thus improve the working of the process.

II.—Destructive Distillation.

The next jotting in my former paper had reference to the manner in which the heat energy of the coke acted in breaking up and re-arranging the elements of the coal during the process of carbonization. Reference was made to my having, at the previous year's meeting, brought before you samples of gases, all containing exactly the same weights of carbon and hydrogen, yet all having different volumes and illuminating powers. This revealed the strange fact that small volume and low illuminating power may go together. It was explained that these differences in the character of the gases were to a large extent due to the differences of potential energy stored up in the different gases; that the object aimed at in carbonizing our coal was so to transmit the heat energy of the combustion of the coke to the volatile hydrocarbon constituents of the coal that as large a yield of gas of as high an illuminating power as possible might be produced; that these results were largely dependent upon the way in which the heat energy of the coke was made to act upon the coal; and that there were three methods by which the heat can be transmitted to the coal—namely, (1) by direct conduction through the mass of coal contained in the retort, (2) by the convection of the volatile constituents from the coal, bringing them into contact with the walls of the retorts, and (3) by radiation from the walls of the retorts through the volatile constituents of the coal in the empty space above the charge in the retort.

The manner in which the heat acted when applied in these three ways had, on a former occasion, been technically dealt with in detail before a kindred Association; and to that paper you were referred. But it was briefly stated that when the heat energy of the coke is transmitted to the volatile products from the coal by contact between them and the hot surfaces, either of the coked portion of the coal, or by contact with the heated walls of the retorts, or by means of convection, there is an indiscriminate transference of the heat to the various volatile constituents of the coal; that they are in consequence shattered, broken up, and re-arranged in a manner not consistent with our wants; that, on the other hand, when radiant heat acts upon the volatile products from the coal it has a selective action, breaking up and re-arranging the constituents of the coal more in the manner we desire; and that to allow the heat to act as radiant heat, it is absolutely essential that there should be a free space in the retort, and that this free space should be of certain dimensions in relation to the charge of coal.

Recent Developments.

Our knowledge, or at any rate our experience, of the process of carbonization has undergone a large development since the date of that paper. We have had the introduction of various oil-gas processes, inclined retorts, and, latterly, the carbonization of coal in coke-ovens, in all of which the process of carbonizing has been more or less modified.

On several occasions where these different processes have been under consideration, observed conditions and results have been described, and statements have been made regarding them, most of which, while substantially confirming the soundness of the views which were formerly expressed regarding the action of heat during the process of carbonizing, yet indicate a misconception of the fundamental principles underlying the process of carbonization or destructive distillation, and of the observed results obtained.

The object of destructive distillation, as the name implies, is, in the case of gas manufacture, to destroy the existing constitution of the molecules present in the coal or oil, and to re-arrange the constituents into new forms, so as to produce the largest volume of such gas as shall have the greatest heating and illuminating power. As all modes of destructive distillation are progressive—that is, are invariably effected in stages—it follows that in the case of coal, the volatile hydrocarbonaceous constituents must be evolved from the coal mainly as crude oil vapours, accompanied by a small volume of simultaneously evolved gas; and that these crude oil vapours are further decomposed, stage by stage, as heat is poured into them at higher and higher temperatures. If such be the case—and of this there can be little doubt—then the process, and more particularly the final stages of destructive distillation, can be most readily and conveniently studied by first considering the analogous phenomena observed in the destructive distillation of coal and shale for the production of oil, in the simple distillation of the oils in the process of refining, and in the cracking-up of the oils into gas.

Oil Distilling and Refining.

The object of the oil-distiller is to produce from the hydrocarbonaceous part of the coal or shale as large a yield as possible of liquid paraffins; and he finds that the lower the temperature at which he carbonizes or destructively distils the coal or shale the more perfectly does he attain his object. But even at the very lowest temperature that will decompose the volatile constituents of the shale, a portion is unavoidably converted into permanent gases; and a further portion is also cracked-up into liquid hydrocarbons other than paraffins (mainly olefines). It is further observed that the volume of gas and the decomposition of the higher paraffins into simpler paraffins and olefines not only increase as the temperature of distillation rises, but that they are also still further increased when there is a vacant space in the retort above the surface of the contained shale. It is found, however, on passing through the shale and the vacant space in the retort an inert gas, or else steam, which, at the low temperatures employed, acts as an inert gas would do, that the effect of the high temperature and the vacant space is much reduced; and the oil distiller has been enabled by this means to distil his shale at a slightly higher temperature and in a shorter time than he could have otherwise done.

In the subsequent distillation of the crude oils during the process of refining it was found that, even at the temperatures necessary simply to distil the oils, there was a certain amount of cracking-up. Not only were the higher paraffins broken down, but even permanent gas was produced; and, as in the case of the distillation of the shale, it was observed that decomposition of the oils increased as the vacuous space over the surface of the oils increased. The oil distiller got over the difficulty through keeping the vacuous space at a minimum, and through making the process of distillation continuous—feeding in the oils at the same rate as they distilled; and he employed a current of steam in the still as an equivalent for an inert gas in the retort.

When the respective market values of the heavy and light oils were such as to make it desirable to increase the quantity of light oils, the heavy oils were partially cracked-up, by purposely charging large stills with a small quantity of the heavy oil; leaving a large vacuous space above. The temperature employed was necessarily that at which the oils slowly distilled into the vacuous space, where they were subjected to the radiant heat from the surface of the oils and from the walls of the still. Even at that low temperature the heat slowly cracked-up the heavy oil vapours; large volumes of permanent gas were produced; and light oils distilled over into the condenser.

In conducting such a process, it was observed that the cracking-up got gradually slower; that the residual oils in the still became of a more and more stable character; and that by-and-bye there was a balance between the decomposing power of the radiant heat over the molecules of the oil vapours and the power of the molecules to resist the cracking-up action. The process was never very successful, on account of the light oils produced having a disagreeable smell, which was difficult to remove by chemical treatment; and besides, there was considerable loss by reason of the quantity of gas produced. I merely mention the process as a step leading forward to the further development of decomposition or cracking-up of hydrocarbon vapours, by what has come to be known as the Peebles process.

The Peebles Process.

The principles of this process are, in some respects, substantially identical with those of the process of cracking-up the oil which we have just been considering. The only essential difference in this sense consists in the higher temperature employed, which hastens the process and enables the vapours of the oil to be completely cracked-up into gas and fixed carbon. The oils are similarly run into large cylindrical retorts, and are volatilized into the vacuous spaces over the oils, where they are cracked-up by the radiant heat in an atmosphere of their own vapours. The partially cracked-up vapours are subjected to condensation; the portion cracked-up into permanent gas passing away for use, while the imperfectly decomposed portion is returned to the retort to undergo further decomposition. Ultimately, the whole original hydrocarbon constituents of the oil or tar are fractionally cracked-up stage by stage, and mainly by the action of radiant heat, into permanent gas of high illuminating and enriching power and solid carbon in the form of hard coke.

Difficulties Encountered.

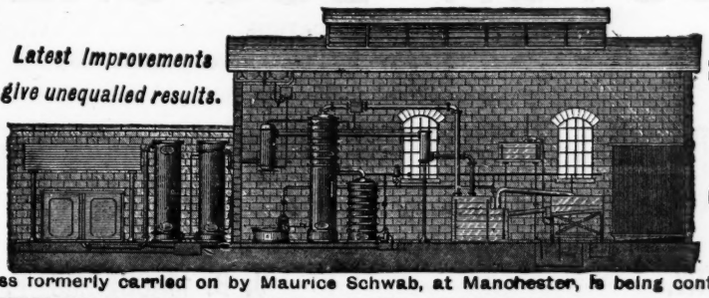
Although, however, the results obtained from the cracking-up of oils and tars prove that the principles of the process are sound, yet, as many of you are aware who have either worked the process or made yourselves conversant with the working of it, the carrying of those principles into practical operation is not unaccompanied by difficulties, both of a mechanical and physical nature.

A study of the causes of those difficulties, more particularly the physical ones, is highly instructive as giving us an insight into the principles involved in the process of destructive distillation.

MAURICE SCHWAB, FORMERLY OF MANCHESTER.

WILTON'S PATENT SULPHATE OF AMMONIA DISCHARGERS AND SATURATORS.

Latest Improvements give unequalled results.



SULPHATE OF AMMONIA APPARATUS OF THE MOST MODERN CONSTRUCTION.

REFERENCES, &c., ON APPLICATION.

The Business formerly carried on by Maurice Schwab, at Manchester, is being continued by

THE CHEMICAL ENGINEERING COMPANY,

Under the Management of Mr. Schwab.

Offices: 61 & 62, GRACECHURCH STREET, LONDON, E.C. Works: ABBEY LANE, STRATFORD, LONDON, E.

Telegraphic Address: "OWSTON, LONDON."

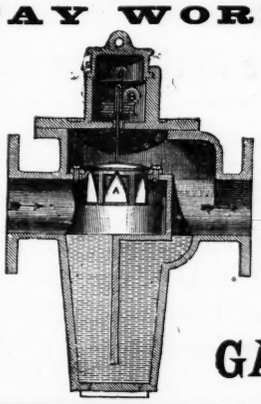
D. BRUCE PEEBLES & CO.,

TAY WORKS, EDINBURGH.

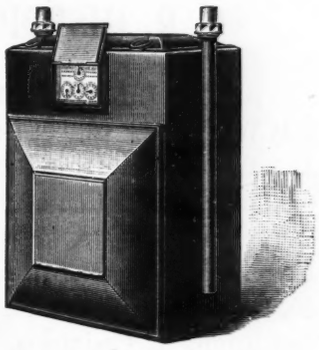
STREET-LAMP GOVERNOR.

DISTRICT GOVERNOR FOR HILLY TOWNS.

Reduces pressure as desired then responds to Station Governor (entirely Automatic).



WET & DRY GAS-METERS AND EVERY DESCRIPTION OF GAS-GOVERNORS.

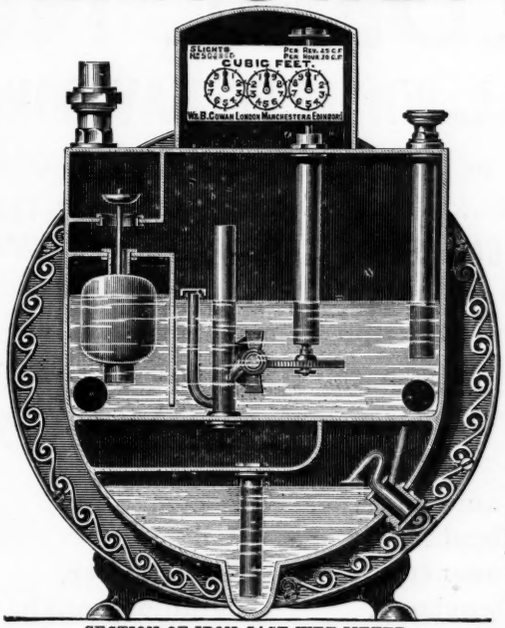


W. & B. COWAN'S WET METERS

IN TIN AND CAST-IRON CASES.

A Speciality in our Wet Meter is **THE WARNER & COWAN DRUM, which ensures accurate registration,** independent of the height of the water-line; whereas, in the ordinary Wet Meter, the evaporation of water tends to make the registration slow, to the prejudice of the Gas Company.

THESE METERS STAND HIGH PRESSURES.



SECTION OF IRON CASE WET METER.

IN TIN AND CAST-IRON CASES.

Another important feature in our Wet Meters is **WM. COWAN'S PATENT SYPHON OVERFLOW,** by which, when watering the Meters, the water-line is attained **with rapidity, certainty, and exactitude;** and it is impossible for any water afterwards to find its way into the waste-box.

THESE METERS STAND HIGH PRESSURES.

W. & B. COWAN, LTD.

ESTABLISHED 1827.

SMITH SQUARE WORKS, WESTMINSTER, **LONDON, S.W.** TELEPHONE No. 250 WESTMINSTER.

DALTON STREET WORKS, NEWTOWN, **MANCHESTER.** TELEPHONE No. 1545.

BUCCLEUCH STREET WORKS, **EDINBURGH.** TELEPHONE No. 753.

COLONIAL METER WORKS, MACQUARIE PLACE, **SYDNEY, N.S.W.** TELEPHONE No. 2520.

TELEGRAPHIC ADDRESSES:

"DISC, LONDON." "DISC, MANCHESTER." "DISC, EDINBURGH." "DISC, SYDNEY."

Telegraphic Codes used, A1 and A.B.C. 4th Edition. Special Code furnished on application.

DUTCH BOG-ORE

FOR GAS PURIFICATION.

The Finest Quality in the Market

FROM THE

Eerste Hollandsche Yzerertsmaatschappy ROTTERDAM.

(THE FIRST DUTCH BOG-ORE COMPANY, LIMITED),

For Particulars apply to the Sole Agents of the Company in Great Britain :

CHARLES E. FRY,
TOWER CHAMBERS, BROWN STREET,
MANCHESTER.
Telegraphic Address: "ALLOYS, MANCHESTER."

J. B. MACDERMOTT,
11, *BOTHWELL STREET,*
GLASGOW.

RECOVERY OF SPENT LIMES.

G. R. HISLOP'S Patent Improved Lime Revivifying Apparatus.

SPENT LIME as carbonate is RESTORED at a cost considerably under that of New Lime, and that WITHOUT LIMIT to its DURABILITY, and with UNIMPAIRED EFFICACY as a Purifying Agent. The LIME is RESTORED on the PREMISES; ECONOMY of SPACE is SECURED by the non-accumulation of Spent Lime—thus SAVING all TROUBLE and EXPENSE in the disposal of the Lime as waste. The PROCESS can be USED in any LOCALITY without becoming a nuisance. Enquiries respectfully solicited. Full Particulars from Messrs. SAMUEL WHILE & SON, 60, Queen Victoria Street, LONDON, E.C.; or from the Principal Agent, R. F. HISLOP, F.C.S., Gas Engineer, Craigielea, PAISLEY.

A NEEDFUL NOTICE

TO ALL WHOM IT MAY CONCERN.

We hereby intimate to Chairmen and Members of Gas Committees, Engineers and Managers of Gas-Works, that we have **PURCHASED THE BUSINESS AND PATENTS OF THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED,** Westminster, London, and are now the Sole Owners of the Patents of the pre-eminently successful system of Self-Acting Conveyors and Elevators in combination with the Storage Hoppers, the Measuring Chambers, and the Charging-Shoots, forming together the much admired and happily-designated "powder-pouch" method of charging Inclined Retorts, now in operation, or in course of erection, at—

Aberdeen,	**Cambridge,**	**Leeds,**	**Nine Elms,**
Batley,	**Chesterfield,**	**Leigh,**	**Rotherham,**
Bow Common,	**Coventry,**	**Manchester,**	**Smethwick,**
Brentford,	**Dewsbury,**	**Middlesbrough,**	**Todmorden,**
Brighouse,	**Dudley,**	**Middleton,**	**Wakefield,**
Burnley,	**Gateshead,**	**Nelson,**	**West Hartlepool,**
Burslem,	**Huddersfield,**	**Newcastle,**	**Wolverhampton.**

PLEASE ADDRESS:

NEW CONVEYOR CO., LTD., SMETHWICK.

Experience in the working of the process shows that, owing to the chilling action consequent upon the evaporation of the stratum of liquid oil or tar on the bottom of the retort, the lower parts of the retort contract while the upper parts remain expanded, causing fractures at the lower parts; and when the retorts are made of fire-clay to stand the higher temperature required for the cracking-up of the tar, the retorts get disintegrated and lengthened through the tars being absorbed by the porous clay, more particularly at the cooler parts where they pass through the front walls and join the iron mouthpieces. The oils or tars thus absorbed swell up in the final coking process with enormous force, and push out the front walls.

The physical difficulties arise from the fact already referred to, in the kindred process of cracking-up the heavy oils into lighter ones, that as the cracking-up process progresses, the portion of the vapours left undecomposed becomes more and more stable in character. Those of you who have worked the process will have observed that on starting it with fresh oil each retort would produce (say) 500 cubic feet per hour, that although the heat upon the retort was kept as nearly as possible at the same temperature, and although the stream of oil and condensed residues flowing back into the retort was also kept the same in quantity, the make of gas would day by day fall away, till it became less than half of what it had been at the time of starting with fresh oil. That observed fact made it perfectly evident that under the conditions obtaining there was a relation between the constitution of the hydrocarbon vapours in the retort and the proportion of those vapours that could be cracked-up by heat of a given temperature; and that as the vapours got changed in character by the action of heat of a given temperature, what remained became more stable and more able to resist the cracking-up influence of that temperature.

There were three ways in which the make of gas could be increased: (*a*) By increasing the flow of mixed oil and residues returning to the retort, while keeping up the heats upon the retort to the same temperature; (*b*) by raising the temperature of the retort and retaining the original rate of flow of oil and residues into the retort; or (*c*) by increasing the flow of oil and residues into the retort and, at the same time, increasing the temperature of the retort.

When the flow of oils and residues into the retort is made so large that the quantity of fresh oil present in the flow is equal to the original stream of oil, and the temperature of the retort is kept the same, the make of gas is increased; but not in proportion to the increased flow. It is not even equivalent to what the oil present in the flow would have produced had it been isolated from the residues. This shows that the vapours from the residues are not only left uncracked, but that they have a preservative action. They prevent the oil vapours from being cracked-up; and thus they act as steam or an inert gas did in the process of destructively distilling shale in order to obtain oil, and in the subsequent distillation of the oils. The conditions which were highly beneficial when the object was to obtain liquid products, are thus objectionable and detrimental when the object is to convert the oils into permanent gas.

When it is attempted to increase the yield of gas per retort by either (*b*) or (*c*) methods, the volume of gas increases; but the illuminating power, and more particularly the enriching effect per unit of oil, fall away. The increased temperature necessary to overcome the preservative action of the more stable residual vapours thus has not a beneficial but an injurious effect; besides which, it involves waste of the energy of the fuel employed to heat the retort.

The better method was found to be to continue the process of cracking-up the oils and residues up to a certain stage—that is, so long as the vapours of the residues did not interfere to any injurious extent with the cracking-up of the oil vapours. Then, on the cracking-up process reaching that stage, the residues are cracked-up by themselves; the temperature of the retort being raised till all are reduced to gas and coke.

The Causes of These Difficulties.

An analysis of successive portions of the residues and of the gases, as the process of cracking-up progresses, reveals the reason for these observed results. One would naturally suppose that it would be the vapours of the most volatile hydrocarbons that would be first cracked-up, and that the more stable compounds present in the residues would be those having a high boiling-point. Such, however, is not the case; for as the cracking-up process progresses, it is found that the higher paraffins—the olefines, and, if present, the oxy-hydrocarbons—are the first to yield to the action of the heat. During the early stages of the cracking-up of coal tar, the gas sometimes contains from 15 to 20 per cent. of carbon monoxide, derived from the cracking-up of the creosols, carbolic acid, &c. As these compounds disappear, the vapours of the homologues of the benzol series appear in increasing quantities, and as, in turn, they disappear, pure benzol and naphthalene make their appearance in increasing quantities. Ultimately, in the case of the cracking-up of coal tar, the sole distillate from the residues, during the last stages, forms a solid cake of naphthalene.

It is thus seen that for the major part the stable compounds left in the residues are highly volatile. On being returned to the retorts, they simply volatilize at the low temperature; and, being highly stable, they act after the manner of an inert gas, preventing the oil vapours from being cracked-up by the radiant heat. It would thus mainly be the portions of the vapours which come into direct contact with the hot walls of the retort that are cracked-up into gaseous compounds. On stopping the oil supply and cracking-up the residues, by returning them again and again to the retort by themselves, one portion of the residues is cracked-up into permanent gas; and that gas serves as the vehicle or medium for taking up the remaining uncracked but volatile benzol, &c., in diffusion.

Remedies.

These observed results naturally suggested the use of a supplementary supply of gas, obtained from sources outside the oil, to take up the benzol and other volatile hydrocarbons as these were produced by the decomposition of the oil. Both water gas and ordinary low-quality coal gas, unsaturated with hydrocarbons, were used, and both with success. These gases were introduced into the hydraulic main of the oil-gas plant, among the warm products from the oil. The gas was thus enabled to take up, and hold in diffusion, these volatile vapours that would have otherwise been condensed and returned to the retort, and interfered with the cracking-up of the oil. Not only was the make of gas per retort per hour thus considerably increased, but there was a large increase in the illuminating value per unit of oil used. When the oils were cracked-up by themselves, and the resulting gas was used to enrich the coal gas, a gallon of oil yielded from 1600 to 1700 candles of enrichment; but when the coal gas was brought into contact with the hot products from the decomposition of the oil, the enrichment went up to 1800 to 2000 candles per gallon of oil. The reason for this great increase was that, while a gallon of volatile hydrocarbons as distilled from the residues, when diffused through coal gas, gives an enrichment value of from 4000 to 5000 candles, the same gallon of liquid hydrocarbons, if cracked-up so as to produce gas from one portion to take up the remaining part in diffusion, only produces from 500 to 600 candles illuminating power.

Effect of Inert Gas.

From what has already been said as to the principles underlying the decomposition of hydrocarbons, it will be evident that to have admitted water vapour or other unsaturated gas into the retort among the vapours of the oils and residues would have increased the difficulty in effecting the decomposition of those vapours. When, as in the case of the carburetted water-gas process, the oil vapours have to be cracked-up in the presence of the inert water gas, it has been found necessary to make the vacuous spaces through which the combined gas and vapour passes extremely narrow or thin, so that the radiant heat never has more than a short distance to penetrate in order to reach the vapours; and, besides this, the surface of the brick checker work is made enormously great in proportion to the quantity of oil vapours to be decomposed.

With or Without Inert Gases in Cracking-Up?

As already stated, it has been frequently asserted that when oils are cracked-up by having their vapours diffused through an inert gas and subjected to the decomposing influence of heat, they are cracked-up in a manner which yields a higher illuminating or enriching value than that which could be obtained from the same oil when the vapours were cracked-up by themselves. The way the statement is sometimes made is very misleading. It is quite true that if we crack-up oil vapours by themselves into permanent gas and condensable residues, and thereafter mix the permanent oil gas so obtained with water gas or coal gas, less illuminating value is obtained than would have been the case had the oil been cracked-up in the presence of water gas or coal gas; but the lower yield in the one case, and the higher yield in the other, is no conclusive evidence that the difference was due to the nature of the cracking-up process. If the residues from the cracking-up of the oil by itself (which will vary in quantity from 25 to 35 per cent. of the original oil, according to its constitution and the temperature at which it is cracked-up) are examined, they will be found to contain a high percentage of very volatile hydrocarbons, which the saturated oil gas could not hold in diffusion. If, however, the oil residues be warmed up, and if the water gas or coal gas be passed through the residues, these volatile constituents of the residues will pass in diffusion into those permanent unsaturated gases, and will remain permanently in diffusion; and if a volume of water gas or coal gas, thus carburetted with the volatile vapours from the residues, be now commingled with the oil gas, the resulting illuminating or enriching value of the combined oil gas and vapours from the residues will be found to equal, and possibly to exceed, that obtained from the same oil carbonized or cracked-up in the presence of the inert gas. Any difference that would exist would be entirely dependent upon the relative temperature at which the oils had been cracked-up under the two conditions.

The fact that our esteemed member, Mr. Foulis, who has had great experience in the cracking-up of mineral oils, and who uses oil for enriching power alone, has abandoned the method of cracking the oil vapours in the presence of water gas, and adopted in place of the checker brickwork large cylindrical retorts, in which the oils to be used for enriching the coal gas are cracked-up in an atmosphere of their own vapours, mainly by the action of radiant heat of comparatively low temperature,

is strong evidence as to the soundness of the principle of the latter method of cracking-up oils.

Early Experiences.

As directly bearing upon the principle of those two methods of cracking-up hydrocarbons, I may be allowed to refer back to some personal experiences of my own, in connection with a modification of what was known as the "hydrocarbon" process. The object of the modification of that process, which was patented by Mr. Henry Aitken, of Falkirk, and the writer in 1875, was more fully to utilize the volatile hydrocarbons produced during the carbonizing of coal, but not capable of being permanently held in diffusion by the permanent gas simultaneously produced from the cannel coal used in Scottish gas-works. The modification to which I refer consisted in providing a supplementary supply of water gas, or other poor unsaturated gas, for the purpose of enabling the volatile hydrocarbons to be permanently held in diffusion.

There were two distinct methods of using this supplementary supply of poor gas. The first method was substantially identical in principle with that recently suggested by Professor Vivian B. Lewes, in his lecture at the meeting of the Institution of Gas Engineers, in connection with the Dellwik process. The only essential difference lay in the method of obtaining the supply of water gas. In the process, as described in the patent, the supply of water gas was produced in a separate set of retorts, any excess of steam was condensed out, and, if necessary, the gas was also purified. The water gas was thereafter passed into and through the vacuous space above the surface of the coal, while this coal was undergoing the carbonizing process in the retort (as stated in the patent specification). This was done because it appeared that the water gas served to shield from over-decomposition the hydrocarbons present in the crude bituminous gases suitable for carburetting the poor gas. The combined gases and products were thereafter subjected to a system of fractional condensation, in which the condensed tars were made to flow back against the current of gases, through a Coffey still arrangement, and in which also the tars were heated; being thus prevented from absorbing the volatile hydrocarbons from the mixed gases, and made to give them up to the water gas.

In the other method—the water gas—or other poor gas, was not passed into the retort, but was only subsequently brought into intimate contact, and mixed with, the gas and other products from the carbonizing of the coal in the Coffey still arrangement. The tar and other products being kept hot, the water gas or other poor gas was thus made to take up in diffusion the volatile hydrocarbons present in the products from the coal.

Now, it is evident that, if the presence of the water gas or other poor gas in the retort had had the effect of advantageously influencing the nature of the decomposition of the volatile constituents of the coal, so as to yield a larger product of illuminants, the results from the two methods would have been very different. The results of a large number of experiments made at the time showed, however, that the gain in the illuminating power which had been obtained by the hydrocarbon process was not necessarily due to the presence of the water gas in the retort. On the contrary, it appeared that, just as in the case of cracking-up the oil, to which reference has already been made, equally good results—nay, even better results—could be obtained by mixing the water gas, or other poor gas, with the products resulting from the carbonizing of the coal after these had left the retort. It was observed that it was very much the temperature and the conditions obtaining during the carbonizing process that influenced the value of the results obtained. Both when passing the water gas through the retort during the carbonizing of the coal, and when only mixing the water gas with the coal gas and products after these had left the retort, the best results were obtained when the temperature of carbonization was slightly reduced.

Professor Frankland, in making his original experiments on the hydrocarbon process, must have made a like observation; for he stated that he used a lower heat upon the cannel retorts when testing the hydrocarbon process than when testing for the results that could be got from carbonizing the coal by itself. It was further observed that, as a rule, the richer cannels gained most by lowering the temperature, while ordinary coal gained least.

These observed results are to a large extent explained by what we have been already discussing as to the process of cracking-up the vapours of liquid hydrocarbons. We have seen that, when a solid or liquid hydrocarbon is carbonized or cracked-up by itself for the production of illuminating gas, the decomposing process is necessarily carried to that stage where the permanent gas produced from one portion of the hydrocarbon is just able to take up, on diffusion, the vapour of sufficient volatility produced from the other portion. If the decomposition is carried beyond that stage, then there is produced more permanent gas than is necessary in order to take up in diffusion the remaining volatile hydrocarbons; and a corresponding part of the hydrocarbon illuminants is decomposed and converted into permanent gas. The illuminating power is thus reduced, both by the destruction of volatile hydrocarbons and by the diluting effect of the larger volume of non-luminous gas. On the other hand, we have seen that, before the decomposing or cracking-up process is carried so far as to effect a balance between the volume of permanent gas and the volatile vapours present in the products and capable of diffusing through the permanent gas, there is a stage where the volatile illuminants are present in large excess, and that some portion of these illuminants has to be partially cracked-up in order to supply the permanent gas necessary to take the remainder into diffusion. Now it is evident that if, instead of cracking-up the one portion of the volatile vapours so as to supply permanent gas in order to take up the remainder in diffusion, there were some independent supply of permanent water gas, it would be unnecessary to carry on the cracking-up process farther than the stage necessary to produce the greatest possible quantity of carburetting and illuminating hydrocarbons. These carburetting hydrocarbons would in that case be taken up in diffusion by the supplementary supply of permanent water gas.

If those deductions from results be sound, then it logically follows that the gain in illuminating power obtained by what was known as the hydrocarbon process was not due to any difference in the nature of the products arising from the better cracking-up of the hydrocarbon vapours in the presence of an inert gas, but was solely due to the power of an inert gas to take up in diffusion the products from the cracking-up of the hydrocarbon vapours; this cracking-up having been effected at a reduced temperature.

In further evidence of that view, it may be mentioned that the hydrocarbon process—that is, the use of a supply of water gas in conjunction with the carbonizing of a hydrocarbonaceous substance—only gave advantageous results when the constitution of the hydrocarbonaceous substance was such as to produce by its decomposition an excess of volatile carburetting vapours over that which the permanent gas, simultaneously produced, could take up in diffusion. Such is the case with oils, cannels, and shales; but with many of the ordinary gas coals, their constitution is such that the permanent gases are produced in excess over the volatile carburetting illuminants. Under those circumstances, the addition of water gas, whether into the retort or into the products coming from the retort, acts mainly as a diluent; and any benzol or other hydrocarbon absorbed by the water gas from the tar is, in most cases, not sufficient to counteract the loss in illuminating power due to dilution by the added water gas.

Analogous Results in Ordinary Retorting.

In fact, with such coal something equivalent to the hydrocarbon process is carried out to its fullest extent by our ordinary method of carbonizing and manufacture. From the very nature of our ordinary carbonizing process, it is practically impossible to subject the coals to the best carbonizing conditions. For some time after the coal has been charged into the retort the volatile products are under-decomposed, and the volatile hydrocarbons are present among the products in excess of what can be taken up by the permanent gaseous portion then being formed. After a time, the proportions of permanent gas and volatile hydrocarbons respectively become adapted to one another. Thereafter the decomposition of the volatile constituents of the coal is excessive; and far more permanent gas is produced than there is hydrocarbon vapour present to saturate it. These successive stages in the destructive distillation of the coal are not, however, arrived at in equal times, nor even at all parts of the length of the retort at the same time. The different stages are passed through in periods which depend upon the distance of the coal from the products outlet. Those products which have to travel a proportionately greater distance, are subjected to the cracking-up influence of the radiant heat from the roof and walls of the retort for proportionately longer periods of time. Thus, the products coming from the coal in the back portions of the retort may reach the over-gasified stage; while the portions in front are under-decomposed. When this is the case, the excess of permanent gas from the back portions of the coal is brought into contact with the excess of volatile hydrocarbon vapours from the front; and this may enable the hydrocarbon coming in excess from the front to pass into and remain in diffusion throughout the gas, instead of being condensed, as would have been the result had it not been for the presence of the permanent gas from the back part of the retort. We thus see that an ordinary retorting process is found, when studied, to embody all the principles of the hydrocarbon process. By-and-bye, however, a stage in the carbonizing is reached when the gasified portion of the volatile constituents of the coal is far in excess of that necessary to take up the hydrocarbon vapours simultaneously produced. From that stage onward there is unavoidable over-decomposition and destruction of the hydrocarbonaceous constituents of the coal.

Intermittent and Continuous Carbonization.

We are thus brought to observe that there are essential differences in principle between what may be described as the intermittent and the continuous carbonizing systems. With a liquid hydrocarbon, the liquid can be conveniently fed into the retort at such a rate that the vapours are cracked-up by the heat to the desired degree; the temperature of the heat on the retort and the rate of feed being adjusted to suit each other. Many attempts have been made to adapt the same continuous principle to the carbonization of coal, by passing the coal through the retort, either by gravitation or by mechanical means, at the same rate as the carbonization progressed. The object has been to have the carbonizing process regulated at all stages, as in the case of oil; but hitherto no practical method

has been discovered by which that desirable end can be attained —failure being mainly due to the caking of the coal into masses.

A New Method.

There is, however, another principle of carbonizing. This is, to make the amount and the temperature of the heat supplied suitable for the carbonizing of an intermittent charge of solid material, or to make them suitable for cracking-up vapours such as may require different temperatures for their decomposition; and it is to that principle that my next jotting refers.

The new process resembles the carburetted water-gas process, or that of Dellwik, inasmuch as the heat required to do the work of gasification is obtained intermittently. The difference is that the heat produced during a period of combustion is applied to, and stored up in, a mass of moving matter, instead of the mass being at rest; and the heat is given out by this moving mass during the gasifying period. The advantage of the moving over the stationary surface consists in this—that the heat of combustion is more equally absorbed and diffused, and that the heated surfaces can by the motion be brought into contact with the substances to be carbonized; and the stored-up heat can thus be transferred, as required, at the desired rate.

I have no doubt many of you will, in passing through an alkali works, have observed what are known as the revolving black ash furnaces. These are large cylinders, built of iron or steel plates, and lined with brickwork. They are carried on circular rails resting in grooved rollers, and are made to revolve by means of a spur-wheel and pinion, driven by an engine. The revolving cylinder has an opening at each end. Through the one end are introduced the producer gases and air to heat up the charge; the products being drawn away by the opening at the other end. A door, or a number of doors, are provided in the side of the cylinder, through which the materials are charged and discharged. These cylinders are sometimes made very large; some being capable of taking a charge of from 18 to 20 tons of material.

Such an arrangement of apparatus suggested itself as being, with slight modifications, highly suitable for carrying out the principle of the modified system of carbonizing to which reference has just been made. The only alterations necessary would be to provide the inlet and outlet openings at the end of the revolving cylinder with gas-tight arrangements. Of these, the one would consist of a pipe passing through a stuffing chest and provided with the necessary valves for the admission of air, &c., during the heating-up period, and for the exit of the products of decomposition during the gas-producing period; the other opening, through which the products of combustion escape, being provided with a door or valve which can be closed during the period of gas making.

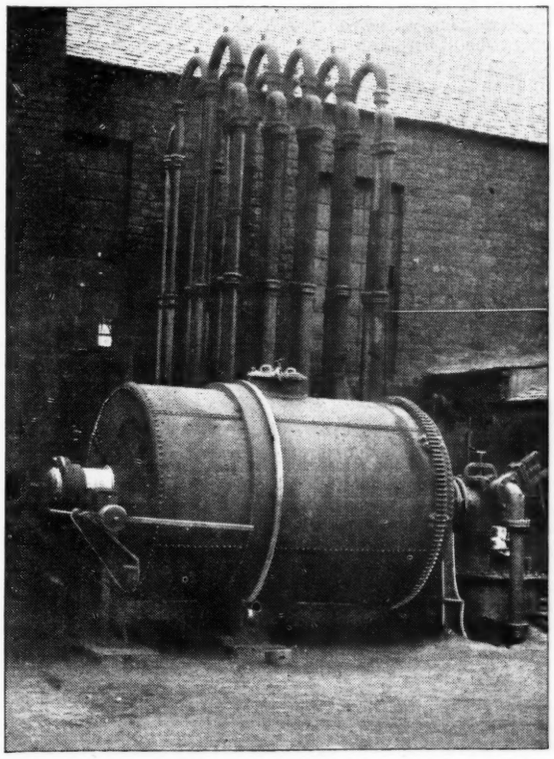
The apparatus may be operated in a variety of ways, according to the substance to be carbonized; but the time at our disposal will not enable these to be considered in detail. The principle in all, however, is the same—namely, to raise a mass of moving material, either in the form of brick linings and ribs, or a charge of coke, or both, to a high temperature. The heat may be derived from fuel in the form of producer gas or liquid hydrocarbons, or by the combustion of a part of the coke in the revolver. On the moving mass of material acquiring the desired temperature, the heating-up process is stopped, and the substance to be carbonized is charged into the revolver. If the substance be a solid, such as coal, then it is all charged in at once. The speed of the revolver is then adjusted, so as to bring the coal and the heated mass into contact, at such a rate as to bring about the desired amount of decomposition. The high temperature in the mass of material within the apparatus at the beginning of the carbonizing process enables the large volume of volatile matters liberated from the coal at first to be effectively cracked-up; and as the carbonizing progresses, and the volatile matters fall away, the temperature in the mass also falls, and thus prevents over decomposition during the final stages. Besides, by varying the rate at which the apparatus revolves, the conditions can be still further adjusted, so as to bring about the desired amount of cracking or decomposition.

When the arrangement is applied to the cracking-up of a liquid hydrocarbon, the process is modified to suit the altered nature of the substance. The liquid residues from a previous run or charge, which require a high heat for decomposition, are first injected into the apparatus, after the blow-up period; and as the temperature of the apparatus falls, fresh oil is added to the residues in increasing quantities till, at the end of the run, pure oil alone is used—the residues from the one run forming the material to begin the gas-making period of the next.

Neither the time nor the opportunity has yet occurred for testing the merits of the principles of the system as applied to the carbonizing of intermittent charges of a solid, such as coal or shale, in such an apparatus. But some twelve months ago an opportunity occurred at the Addiewell works of Young's Paraffin Light Company for testing the system as applied to the cracking-up of liquid hydrocarbons. The apparatus was what may be termed a scratch one, consisting of the gathering together of a number of parts of plant that had been used for other purposes. The revolving cylinder had been used for the carbonating of the soda tars from the refining of the oil. It measured 9 feet long and 6 feet diameter; and the manner in which it is adapted to the new purpose is fairly well explained in the photographic views thrown upon the lantern screen. It will be observed that the axial opening at the end is provided with a 9-inch pipe passing through a stuffing-gland, which allows air and liquid hydrocarbons to be introduced, and the gasified products to pass away through the hydraulic seal-box to the condensers; suitable vessels being provided for receiving the residues or tars. The other axial opening is provided with a gas-tight door hung upon a lever by a central pin, which allows it to rotate along with the revolver.

When operating the apparatus, it is kept charged with coke as high as possible without interfering with the escape of gases through the axial openings; and it has been found in practice to be an advantage, during the blow-up period, to spray in along with the air-blast a portion of residues, as this hastens the heating-up process and utilizes the comparatively valueless residues. The rate of revolution during the heating-up period requires to be very slow, just sufficient to turn over and present fresh surfaces of the lining and of the coke. At the beginning of the gas-making period, when the temperature is high, the revolver may for a time be left at rest; but as the temperature falls, the revolver must be set in motion, and the rate of revolution should be increased as the temperature falls, but should at no time exceed one revolution per minute.

There is produced at each run of this apparatus from 1500 to 1800 cubic feet of gas, in a period of about twenty minutes; and since it has been erected, it has produced about 4 million cubic feet of gas. As far as can be seen, the fire-brick lining is still in good condition.



My object in bringing this principle of carbonizing before you as well as my jottings upon other principles involved in gas manufacture, is, as I have already stated, to guide us in the further development and improvement of our manufacture. With gas oils at their present market prices, there is no inducement to adopt such an apparatus; but from my experience of its working, and from my experiences in carbonizing tar in retorts, and in the stationary form of producer which I had the pleasure of bringing under your notice at our meeting in Glasgow in 1894, I feel warranted in bringing the arrangement before you. It overcomes many of the difficulties previously experienced; more particularly the fracturing and rupturing of the retorts when the tar was cracked up in them, and the clinkering together of the mass of carbon in the producer when the stationary form of producer was employed.

III.—How Should Gas be Tested, and the Best Gas to Supply.

History repeats itself in connection with the gas industry as with nations. It is just a quarter-of-a-century since our worthy member, Mr. MacPherson, brought before you the subject of the relation between the chemical constitution of a gas and its illuminating power, and made remarks regarding the manner in which the value of a gas should be determined. At that date, the illuminating power of gas was the all-important factor, only a comparatively small quantity of gas being used for heating and motive power purposes; and the only known practical method of obtaining light from gas was by the incandescence of the carbon contained in it. The quantity of carbon in the

gas, and the manner in which it was combined, were therefore of vital importance.

Since then, however, the methods by which illumination is obtained from gas have vastly developed, and a far greater amount of light can now be obtained from a given volume of gas by its combustion in a non-luminous flame; substituting a mantle of the rare earths for the carbon as the incandescing and light-emitting body, or else by using the gas to produce light through the agency of mechanical and electrical energy. Besides, gas is now much more extensively used for domestic and industrial purposes, in which the calorific value is all important.

Calorific Value.

These changed methods and uses of gas, in which its calorific value is the main factor, are rapidly extending; and so far as illumination is concerned, the percentage of carbon present in a gas, and the particular method in which it is combined, are losing their importance in respect of the production of light, and the calorific value is rapidly becoming equally important, if not more important, than the illuminating power.

At the recent meeting of the Institution of Gas Engineers, Dr. Harold G. Colman read a most interesting paper on the calorific value of gases. The object of his researches was to ascertain whether it was possible to establish a ratio between the calorific value of a gas and its illuminating power, much as Mr. MacPherson tried long ago to ascertain whether there was a relation between the other characteristics of a gas and its illuminating power. As might have been expected, having in view, for example, the samples of gases which I brought under your notice at the date of Mr. MacPherson's paper, and which all contained the same weight of carbon and hydrogen, but all had different volumes, illuminating powers, and heating values, Dr. Colman found that there was no definite ratio between the calorific value and the illuminating power of a gas.

Seeing that the calorific value of a gas is becoming its main factor, that the carbon is rapidly losing its importance as an illuminating constituent, and that water gas can be produced at a much less cost, per unit of heating power, than a hydrocarbon gas produced from coal, cannel, or oil, and taking into consideration that the heat of water gas is just as suitable, if not more suitable, for all purposes to which the heat of gas is applied, the question naturally suggests itself, Why should we not discard the production of hydrocarbon gas, which is costly to produce, and adopt the cheaply produced water gas in preference?

That question leads us to consider the question, What is the best quality of gas to supply, or, in other words, what are the factors that have to be taken into consideration in deciding the value of a gas to the user? This, in its turn, brings us to the link connecting the technical and the commercial aspects of the question.

What Price per Unit of Energy?

The main commercial factor is, What does it cost the consumer, or rather what price per unit of energy has he to pay for his supply of gas, this supply being, upon the average of his wants, of the kind best suited for his purpose? The price must cover the cost of manufacture and distribution and the interest and other taxes upon the capital invested in the undertaking. The conditions which determine these main factors in the commercial problem are, from a great variety of causes, subject to considerable differences, and, as a consequence, the price per unit of energy is necessarily variable. Further, as these conditions are subject to changes due to the advance of our technical knowledge of how to manufacture, distribute, and utilize the energy conveyed by the gas, there can be no one quality of gas that is, universally and under all circumstances, the best to supply.

While that is the case, however, we may with advantage consider some of those technical-commercial conditions which have a dominating influence on the cost of energy to the gas consumer; and in considering these factors, the calorific power of the gas will be the only characteristic taken into account, as that is the one which can be more reliably determined by experiment, and which is rapidly becoming the most generally useful factor in respect of transmission of energy.

As already stated, the commercial consideration which mainly decides the quality of gas best suited to the consumer is that the quality should be such that it can be supplied through the consumers' meters at the least charge per unit of energy. Energy in the concrete form of coal is sold by weight of coal; and the price includes the cost of mining, the cost of storing, if necessary, and carriage to the point of consumption. Gas is sold by volume, and the price includes the cost of production, of storage, and of distribution; and just as coal costs sometimes more per ton for binging it until it is required and carrying it to the point of consumption than it does to mine it, so does gas sometimes cost more for its storage and distribution than it does for its production. A coal with a comparatively low calorific value might possibly be so easily mined as to cost much less per ton than another coal with a comparatively high calorific value, and, in consequence, it might supply heat at a lower cost per unit at the mine or in the immediate vicinity than the better coal; but gradually, as the distance from the mine to the point of consumption increased, and as the cost for carriage also increased, the coal with the higher calorific value, although much more costly at the mine, might, with the added carriage, become the cheaper coal to the consumer, as it would supply the heat at a less cost per unit at the point of consumption.

To illustrate the point under consideration, we may, by way of example, compare the cost of water gas with a calorific value of 300,000 heat units per 1000 cubic feet, that of coal gas of 600,000, and that of cannel gas of 900,000 heat units. These three gases have, respectively, no illuminating power, and, approximately, 15 and 28 candle power. The cost of producing these three gases will vary according to the position of the works, upon which will depend the cost of gas-producing materials and the value of residuals; and, therefore, on making the comparison, it is necessary to arrive, as nearly as possible, at the average costs, and then to compare the results which would be obtained under the altered relative costs of each gas, due to difference of conditions affecting the works producing and distributing it.

Different Results under Different Conditions.

I have assumed the average costs of production to be, water gas 4d., coal gas 12d., and cannel gas 24d. per 1000 cubic feet. I still further assume that the average capital and other on-cost fixed charges, irrespective of quality of gas, will be about 20d. per 1000 cubic feet; and these, added together, will be the cost per 1000 cubic feet to the consumer. The figures are embodied in the following table:—

TABLE OF COSTS.

Description of Gas.	At Point of Production.			At Point of Distribution.		
	Calorific Power B.T.U. per 1000 Cub. ft.	Cost to Produce 1000 Cub. ft.	Cost of 100,000 B.T.U. in Pence	On-Cost Charges per 1000 Cub. ft.	Total Cost at Point of Distribution.	Cost Price to consumer of 100,000 B.T.U.
		d.	*d.*	*d.*	*d.*	*d.*
Water gas. . . .	300,000	4	1·333	20	24	8 000
Coal ,, ...	600,000	12	2·000	20	32	5·333
Cannel ,, . . .	900,000	24	2·666	20	44	4·888

It will be found, on consulting available statistics, that these assumed costs and values, as given in the above table, are fairly near the averages that have obtained for many years past. As already stated, they are subject, from various causes, to great differences; but by changing the costs given in the columns of the table so as to suit the altered conditions, it will be easy to calculate what would be the best quality of gas to supply under those altered conditions.

As regards the higher quality of gas, there is no doubt that the figures given in the above table apply to the greater part of Scotland, as gas with the higher calorific values represented has been supplied to the consumers in a number of towns at even correspondingly lower prices; and under such conditions, cannel or higher, quality gas is the best to supply.

If the distance from the source of the supply, or if the cost of materials for the production of the higher grades of gas were to increase, and if the cost of the lower grades of gas decreased, the conditions would change, and the balance of advantage might be otherwise; and, in the same way, the present extraordinary rise in cost of materials generally might possibly change the relative values of the different grades of gas. But in the discussion which followed the reading of Mr. Livesey's paper (at the recent Institution meeting), advocating a reduction in the grade of gas in London, Mr. Herring made it plain that here, in Scotland, the recent change in prices had been in favour of the higher grades of gas.

I am quite aware that there are a number of other minor factors which should have been taken into consideration in estimating the relative values of the different grades of gas, and that these factors are both technical and commercial—such as the unit of on-cost per 1000 cubic feet required to pay capital and other charges, and the relative values of the unit of heat for different calorific purposes.

What is Our Duty?

There is also another side of the question as to what is the best grade of gas supply—namely, What grades of gas supply will yield the most profit to the manufacturer and the supplier of gas? The consumer looks to the price per 1000 cubic feet. He does not consider its calorific value, any more than the user of a penny-in-the-slot meter considers the extra price he has to pay for the check thereby put upon his improvidence. As it is put by Mr. Livesey: "The public were asking a cheaper gas; they knew nothing about a lower power." We can form our own opinion as to the attitude we ought to take up in regard to this aspect of the matter. Besides, these and other points will be best brought out by the general discussion of the whole subject which I hope will follow the reading of this paper.

Gas Under High Pressure.

There is, however, one other point to which I might be allowed to draw your attention before concluding, in reference to the supply of the different grades of gas. That is, the supply of gas under high pressure, just as electricity is supplied under high pressure, and with a very similar object—namely, that of lowering the cost of distribution or carriage to the point of consumption.

The calorific value *per unit of volume* of high-grade gas may be looked upon as being due to the power which the carbon possesses of combining with hydrogen and condensing much hydrogen into small volume. The equivalent of that chemical condensation, in enabling gas to be economically distributed or carried to long distances, is mechanical compression. The natural gas in the United States is locked up in the earth's crust under enormous pressure; and when tapped, it can be economically conveyed for long distances. Its high calorific value and high pressure enable a pipe of small diameter to convey to a distance a large amount of heat energy through the medium of gas; and recently in the United States a similar system has been adopted for the transmission of coal gas to long distances, the gas being compressed mechanically at the point of production, and reducing governors being used at the point of distribution.

We have seen that water gas is far and away the cheapest gas per unit of heat energy at the point of production, but that, owing to its low calorific value per unit of volume, it becomes the most expensive to carry long distances. By using up a small part of the low-priced water gas at the point of production, it would be possible, by means of a gas-engine and compressing pumps, to confer upon the bulk of the remaining water gas a high pressure that would enable it to be more economically distributed in a variety of ways, which will at once suggest themselves to your practical minds.

BRICKS AND BRICKWORK IN ENGINEERING CONSTRUCTION.

The lecture which Dr. A. C. Elliott delivered to the British Association of Water-Works Engineers, at their annual meeting at Cardiff, on the "Strength of Bricks and Brickwork," possesses an interest for all branches of the engineering profession; for it is safe to say that there is no section of an important work of construction more fraught with anxiety to the engineer during design and calculation than the masonry and the foundations whereon and whereby it is supported. In this regard, as between masonry and steel and iron work, for instance, there is a distinct difference. The engineer may, and in general does, exact very definite standards of quality in iron or steel work, both with respect to material and workmanship. The science of applied mechanics and the engineering experimental data accumulated during the last fifty years furnish almost unerring machinery for the analysis of stresses and the determination of scantlings; and the designer, free from doubt about the trustworthiness of his calculations, is in a position to apply the whole of his professional power and experience to the realization of the ideal structure—viz., that which mechanically and economically best meets the ends in view. On the other hand, masonry materials are of very variable quality, even in stuff of identical name and origin. The stresses are usually complex in some degree; and often crushing, tension, bending, and shearing coexist from point to point, vieing with each other for the mastery. To the engineer himself inspection is possible only on the face and the top of the last course. Bad weather, be it ever so carefully watched and provided for, always effects a certain, or rather, uncertain, amount of evil; and, inasmuch as there is nothing so weak as green masonry, the forces operating for, and the varying resistances acting to prevent, damage or failure during erection have to be painfully anticipated, considered, and, as far as possible, controlled.

Very properly Dr. Elliott had, at the outset, something to say in regard to mortar; but it may all be summed up in the one sentence that the joint accumulated knowledge on the subject is so great and precise that practically mortar is a solved problem. Passing on, he referred to the early experiments on the crushing strength of building stones and bricks, the cohesive strength of certain cements and brickwork in cement, and the strength of samples of various sandstones and limestones. This brought the Doctor to the heart of his subject. Although, as he says, a knowledge of the crushing strength of stones as derived by operating on sample cubes, and in the case of brick by operating on individual bricks, is valuable, not to say essential, there remains to be determined the strength of the masonry itself. In fact, we should like to solve, if possible, the problem: Given the strength of the stones or bricks, the necessary relative dimensions, age, and mechanical properties of the mortar, to assign with a reasonable factor of safety the proper working loads for the structure during and after erection. This problem can be attacked with any chance of success in one way alone—viz., experimentally; and it must be confessed that we are still far from its complete solution. Nevertheless, something has been done. There is strong evidence that for equal loads the strength of otherwise similar piers and walls diminishes with increase of height; and Dr. Elliott's experiments have often exhibited bulging near the middle of piers considerably before the attainment of the maximum ultimate stress. Though this bulging looks more like bursting than lateral bending, the column formula of Gordon with suitable constants seems to pretty well express the relationship subsisting between tests of very short piers and those of considerable length; and so Dr. Elliott would not hesitate to apply this method of calculation in practice. High brick piers and walls are usually in some degree laterally supported at intervals. But to what extent even rigid support of this nature affects strength as a whole is doubtful, and is an extremely important practical point needing investigation.

An allusion to experiments on brick piers, carried out by the American Society of Civil Engineers about 1888, led Dr. Elliott to give an account of three series of experiments in the same direction recently conducted by the Royal Institute of British Architects. In these, the length of the brick piers was uniform, but considerable—viz., 6 feet; and the cross-section was 18 in. by 18 in., except in the case of Staffordshire blue-brick piers, which were 13½ in. by 13½ in. In the last series, the lime mortar was of the proportion 1 lime to 2 sand, and the cement mortar 1 cement to 4 sand, and the age at testing was uniformly five months.

Name of Brick.	Average Strength of Brick. Tons per sq. ft.	Maximum Stress on Pier. Tons per sq. ft.	Ratio $\frac{\text{Streneth of Pier}}{\text{Strength of Brick}}$
Lime Mortar—			
London stocks . .	84	18·6	0 22
Gault	189	31·1	0·16
Fletton.	221	30·7	0·14
Leicester red . . .	362	45·4	0·12
Staffordshire blue .	780	114 3	0·15
Cement Mortar—			
London stocks . .	84	39·3	0 47
Gault	189	51·3	0·27
Fletton.	221	56·3	0·25
Leicester red . . .	362	83·0	0·23
Staffordshire blue .	780	135·4	0·17

In regard to Dr. Elliott's own experiments, so far as they have gone, they were designed mainly and originally to apply in the

COMPRESSION TESTS OF BRICKWORK PILLARS AT UNIVERSITY COLLEGE, CARDIFF.

—	Number of Experiment.	Red Wire-Cut Bridgwater Thirds.				Red Wire Cut Maindy Thirds.	
		1	2	3	4	5	6
a	Size of cross-section of pillar (inches)	9×9	9×9	9×9	9×9	9×9	9×9
b	Length of pillar (feet)	3·00	2 00	2·00	2·00	2·15	2·31
c	Mortar	Neat P.C.	1 P.C. to 2 S.	1 P.C. to 2 S.	1 P.C. to 2 S.	Common black lime mortar.	1 P.C. to 2 S.
d	Age (weeks)	1	1	2	17	2	2
e	Maximum load on pillar (tons).	44·90	29·70	39·13	41·15	33·23	54·07
f	Maximum stress on pillar { tons per square inch .	0·55	0·37	0·48	0·51	0·41	0·67
	{ tons per square foot .	79·80	52·8	69·5	73·1	59·0	96·1
g	Average compressive strength { tons per square inch	1·84	1·74	2·04	1·84	1·00	1·35
	of bricks separately tested. { tons per square foot	265	250	294	265	144	194
h	Ratio $\frac{\text{line } f}{\text{line } g}$	0·30	0·21	0·24	0 28	0·41	0·50

—	Number of Experiment.	Red Pressed Dennis Ruabon (Two Frogs).			Red Pressed "J.C.E." Ruabon (Two Frogs).		
		7	8	9	—	—	—
a	Size of cross-section of pillar (inches)	9×9	9×9	9×9	9×9	9×9	9×9
b	Length of pillar (feet)	2·25	1·40	0·83	2·23	2·25	1·00
c	Mortar	1 P.C. to 1 S.	Neat P.C.	Neat P.C.	1 P.C. to 2 S.	1 P.C. to 1 S	None.
d	Age (weeks)	1	1	1	17	⅔	—
e	Maximum load on pillar (tons).	72·42	98·65	91·60	78·90	66·05	18·66
f	Maximum stress on pillar { tons per square inch .	0·89	1·22	1·13	0 97	0·81	0·23
	{ tons per square foot .	128·7	167·5	155·5	140·2	117·4	33·2
g	Average compressive strength { tons per square inch	1·45	1·45	1·45	2·14	2·14	2·14
	of bricks separately tested. { tons per square foot	209	209	209	308	308	308
h	Ratio $\frac{\text{line } f}{\text{line } g}$	0·62	0 80	0 74	0·45	0·38	0 11

circumstances of massive brickwork laid in strong mortar subjected to considerable stresses in a somewhat green state—a condition often realized in practice, notably in the cases of tall chimneys and dams. The specifications applying to such structures usually contain clauses strictly limiting the rate of daily or weekly progress; and probably all who have had to do with the drafting and interpretation of such clauses will agree that they are extremely difficult to treat on a rational basis. So far as crushing strength is concerned, it would appear that one week for strong cement mortar might, under pressure of time, be regarded as sufficient allowance between zero and full load. To what extent, if any, this rapid accretion of load would injure the tensile strength of the mortar, or, rather, the strength of adhesion of brick to mortar, Dr. Elliott has not yet determined; but in a bending test of a brickwork block (pressed with two frogs) laid in 1 cement to 2 sand one week old, the maximum adhesive force was ascertained to be 100 lbs. per square inch, or 6·4 tons per square foot.

These experiments, like those already quoted, show that the ratio (strength of pier ÷ strength of brick) tends to diminish with increasing strength of brick. As between the Maindy and Bridgwater wire-cut bricks, and as between the two kinds of pressed bricks, this general conclusion will be found to apply on examination of the tables; and there is presented a strong temptation to construct some sort of empirical formula embodying the principle in question. But if the whole of the tests are regarded from this point of view, it will be found that the general proposition fails—that is to say, taking these tests for what they are worth, the principle is true for wire-cut bricks; it is true for pressed bricks with two frogs; but it is not true as between wire-cut and pressed bricks taken on the run. As matters stand at present, we may, says Dr. Elliott, secure mortar to a definite standard, and stone or bricks to a definite standard of strength; but the strength of the resulting masonry can be estimated only by direct experiment.

However much our knowledge of the strength of masonry may —as it undoubtedly will—increase, Dr. Elliott is hopeless that any factor of safety to operate on the ultimate strength less than 10, can ever be adopted in any circumstances whatever. In the testing-machine serious damage is almost always accomplished before the load has attained one-third of its maximum; and with only a ratio of 3 to allow for workmanship and weather and other accidents, we attain a factor of 9. Then there are the foundations, worth at least 1½, or, in doubtful cases, 2; and this brings the factor of safety (roughly) from 14 to 18—say, 15 at the smallest ordinary computation.

In thanking Dr. Elliott at the close of the lecture, Mr. William Watts, the Engineer of the Little Don Valley Water-Works of the Sheffield Corporation, made a practical suggestion. He said he wished the Doctor could be induced to continue his experiments on another substance of structural value—viz., concrete. In all his (Mr. Watts's) work, wherever he could put in concrete in preference to brickwork he did so. He would not advise that concrete should be used for surfaces; but wherever it could be put in as a backing, nothing better could be used.

INCANDESCENT GAS LIGHTING IN PARIS.

The current number of the "Journal des Usines à Gaz" contains the following particulars of the streets and public places in Paris lighted by incandescent gas-burners on the 30th ult.:—

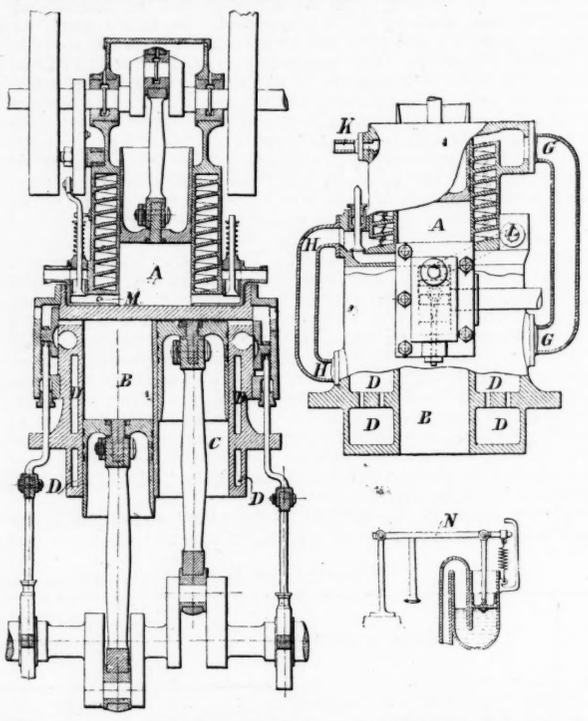
Place.	Burner.	Hourly Consumption per Burner. Cub. Ft.
Place Vendôme	St. Paul	8·9
Rue Castiglione	Auer No. 3	5·3
Place du Théâtre Français	Auer No. 2	3·5
Plateau St. Honoré	St. Paul	8·9
Place du Palais Royal	Denayrouze	9·9
Rue de la Paix	St. Paul	8·9
Rue du Quatre Septembre	Denayrouze	9·5
Avenue Victoria	,,	6·0
,, ,,	Auer No. 3	5·3
Place de l'Hôtel de Ville	St. Paul	8·9
,, ,,	Denayrouze	9·5
Place du Parvis Notre Dame	Auer No. 2	3·5
Avenue des Champs Elysées	Denayrouze	5·3
Place de la Concorde	Auer No. 2	4·0
,, ,,	Auer No. 3	5·3
,, ,,	Auer-Bandsept	5·3
Place St. Augustin	Auer No. 3	5·3
Rue Tronchet	Auer No. 3	5·3
Boulevard Haussmann	Auer No. 3	5·3
Boulevard Malesherbes	Denayrouze	5·3
Boulevard Magenta	Auer No. 3	5·3

In the Place Vendôme and the Place de l'Hôtel de Ville, the St. Paul burners are installed singly and in clusters of three. The Denayrouze burners in the latter place are in groups of three; while in the Place du Palais Royal they are in clusters of five. In each lamp, therefore, in this much-frequented part of the city, there is a consumption of about 50 cubic feet of gas per hour. In the Place de la Concorde, the lamps are to a large extent fitted with two Auer or two Auer-Bandsept burners. The St. Paul burners in the Rue de la Paix light that important thoroughfare very effectively. The lamps in the adjacent Rue du Quatre Septembre are fitted with two Denayrouze burners—a similar arrangement being adopted for the lighting of the Avenue des Champs Elysées.

REGISTER OF PATENTS.

Gas Engines and Motors.—Theryc, C., of Marseilles. No. 15,956; Aug. 4, 1899. Date claimed under International Convention, Feb. 13, 1899.

This invention relates to a motor device or compound generator and motor, shown in vertical section along the axis of the shafts, and in broken section perpendicular to the axis of the shafts. The compound generator and motor comprises: (1) A compressing cylinder A, in which the combustion of the explosive mixture is effected. (2) A reservoir D, surrounding the compressing cylinder and the driving cylinders, and in which are stored under pressure the combustion gases, as will be explained further on. (3) Two driving cylinders B and C, in which the expansion and work of the gases is effected. The apparatus operates in the following manner: The piston of the compressor cylinder A draws through an automatically acting valve carburetted air or an explosive mixture, which it subsequently compresses, and the explosion of which is effected by an electric igniter M. Under the effect of the expansion and of the strong pressure of the gases subsequent upon the explosion, a differential valve, which normally closes communication between the compressor cylinder A and the reservoir D (which are connected by a pipe H), opens automatically and admits into this reservoir the larger portion of the gases resulting from the combustion. The essential function of the valve is to prevent the explosive mixture, during its compression, from entering the reservoir D, and to only admit it after combustion. The valve comprises a bent tube connected with the reservoir D; part of the valve forming a syphon containing oil, above which is a small differential piston which actuates the valve by a lever-arm N, held in position by a balance-spring. As the power of the spring is so adjusted as to be greater than the pressure resulting from the previous compression of the explosive mixture, and smaller than the far more energetic pressure resulting from the explosion, the valve in the position indicated will counteract and prevent the explosive mixture entering the reservoir at the moment of compression, and will only permit the gases burnt in the explosion to enter. As the reservoir D becomes charged with the products of combustion, back-pressure on the valve would be created, and tend to keep the valve closed against further entry of the products of combustion.



This device is provided to neutralize or counterbalance the back-pressure, since it is evident that, whatever pressure exists in the chamber D and tube H, acts not only to keep the valve against its seat, but it also acts upon the piston through the interposed fluid, and thus tends to raise the lever N, and with it the valve from its seat—the pressure on both sides of the valve being thereby equalized; and consequently the spring on the end of the lever will always exert a constant action upon the valve.

The piston of the compressor cylinder A, under the impulse of the explosion, subsequently moves outwards and inwards under the force acquired by the fly-wheels, causing the gases which have not been able to enter the reservoir to be expelled. At the same time, water is injected through an admission-port K; and this water becomes vaporized in contact with the walls of the compressor cylinder, while circulating in the spiral conduit around the cylinder. The steam generated passes into the differential valve, wherein it is intimately mixed with the gases forced by the explosion, and (while becoming superheated in contact therewith) lowers the temperature of the gases to a normal degree. The mixture resulting therefrom passes through the conduit H into the reservoir D, where it is stored, ready to act and to expand alternately in the driving cylinders by the action of the slide-valves. It is introduced through a conduit or pipe G, which terminates at the top of a second spiral conduit around the compressor cylinder. This second spiral is provided round the cylinder side by side with the first mentioned conduit, and terminates in a distributing chamber L, whence it passes to the slide-valves. The gaseous mixture, after having acted upon the driving pistons, flows out through the exhaust-pipes.

It is claimed that the economy of this construction lies in the fact that a large portion of the heat may be utilized which is set free by the explosion: "(1) By reducing more or less the richness of the explosive mixture, by the addition of air, and by increasing in proportion the compression of the mixture in order to obtain a good combustion. (2) By producing and superheating steam in a suitable quantity, the action of which unites and combines with that of the gases, while at the same time reducing the temperature of the walls, and of the apparatus generally, to a degree compatible with the proper working of the constituent parts."

Regenerator Settings.—Broadhead, J. W., of Elland. No. 17,361; Aug. 28, 1899.

This invention (in reference to the division-walls of flues in regenerator furnaces or settings) consists in placing between the secondary-air and the waste-heat flues—instead of the ordinary flat tiles or bricks usually employed—corrugated or fluted tiles, whereby "the efficiency of the recuperation of heat and the working of the setting are greatly improved."

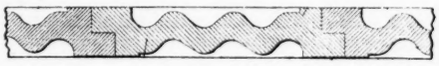


Fig. 1.

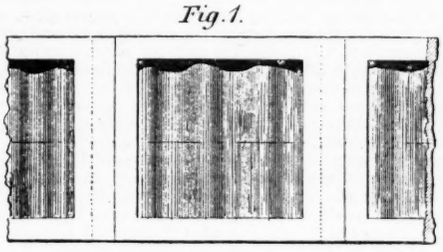


Fig. 2.

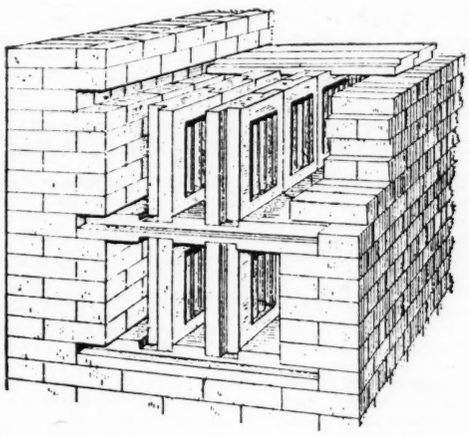


Fig. 1 is a sectional plan and elevation of a fragment of a division-wall formed of these special tiles or bricks. Fig. 2 is a perspective view of part of a regenerator furnace, showing one way of applying the corrugated tiles to divide the waste-heat flues and air-passages.

The tile is made flat or plain for a short distance from each outer edge towards the middle on both sides, so as to form wide margins, mouldings, or frame portions on the two faces of the tile; and the part of the tile within, or surrounded by, the mouldings or frame portions is corrugated or fluted on both faces. The increased strength gained by the corrugations enables the middle portion of the tile to be made much thinner than the tiles or bricks hitherto employed for the same purpose, "whereby heat is more rapidly conducted from side to side of the tile or brick, while the corrugations largely increase the surface areas for the absorption or collection and radiation of heat." The plain or flat surrounding also enables good, firm joints to be made.

At the edges or sides, where the tiles are to join each other, rebates may be formed to make joints between each tile, as shown, or the edges may be straight so as to form flush joints, or else tongued or grooved, as desired.

When there are two waste-heat flues with a secondary-air flue sandwiched between them, the corrugated tiles will form the division-walls on each side of the secondary-air flue, as illustrated at fig. 2. Used in this way, "the corrugated tiles enable a very efficient shallow regenerator to be constructed."

Fractional Scrubbing and Washing of Gases (also Applicable to the Fractional Distillation of Liquids and Condensation of Vapours).—Young, W., of Peebles, Glover, S., of St. Helens, and Glover, T., of West Bromwich. No. 17,620; Aug. 31, 1899.

This invention relates to apparatus of the type described in patent No. 1587 of 1881—apparatus "employed for washing, scrubbing, or similarly treating a gas (such as illuminating gas) obtained from coal, oil, or the like."

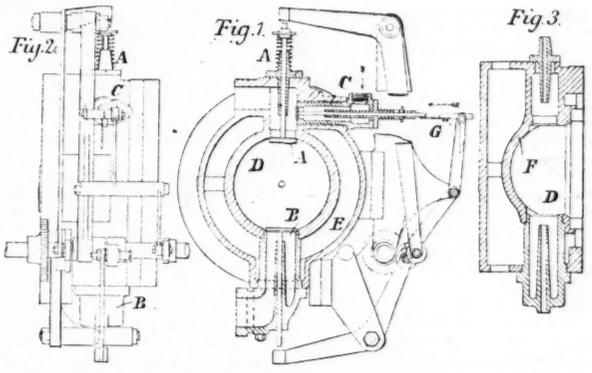
The apparatus there referred to consists of a number of superimposed compartments divided by horizontal partitions, or of a number of vessels formed with horizontal bottoms, provided with a large number of upwardly projecting tubular extensions which permit the passage of gas from the under side of a partition to the upper side. Each of these tubular extensions is surmounted by a flanged cap, the flange of which surrounds the extension and projects downwards to a certain extent into the liquid contained upon the partition or horizontal bottom. The edges of the flanges of the caps are corrugated, serrated, or perforated. Gas passing upwards through any tubular extension displaces the cap vertically to a slight extent; passes downwards; and bubbles through the liquid—being broken into fine streams by the serrations upon the flanges. The caps are, to some extent, held in place in the tubular extensions by downwardly projecting pins which fit loosely into the gas passages. The apparatus as thus constructed (the patentees point out) possessed some disadvantages, the chief of which was that a sudden rush of gas was liable to blow some of the caps out of position, or cause them to rise irregularly and tilt to one side—the gas thus escaping or passing through without being properly treated. Another defect was that any matters which were in mechanical suspension in the gas and were carried forward by it, were liable to become deposited on the tops of the caps, and thus load them to such an extent that they became too heavy to rise and permit the free passage of the gas. The suggested improvement is for the purpose of obviating these disadvantages.

The specification of the present invention is not illustrated; but the patentees fully describe their proposals, as follows: In carrying these improvements into effect, and to prevent the caps having any considerable independent or individual motion, each of them is formed with a wire stem which projects loosely downwards through its tubular extension, and is of a length to almost come in contact with the cap immediately below it on the next lower horizontal partition or bottom. Each cap is also provided with an eye fixed centrally upon the top of it, which eye may be an extension of the stem. By means of these eyes and suitable connecting wires, the caps are flexibly connected in a single group in each bottom or layer, or in two or more groups in each layer. By these means, the upward movement of any individual cap is communicated to its neighbours, and is resisted by their weight. Moreover, should the upward movement of any cap become excessive, it encounters the bottom of the spindle of the cap vertically above it, and is thereby prevented from rising further, or has its upward movement resisted by the united weight of the group of caps above it. In a modification, the stems of the caps need not be long enough to nearly reach the caps in the next lower partition. In this event, the caps of each partition or bottom would rise and fall without affecting those in the next higher partition. In order to precipitate the mechanically suspended matters out of the gas without depositing them upon the tops of the caps, the openings through the tubular extensions are formed with a wider diameter at the bottom than at the top. The velocity of the gas is thus increased, so that it impinges with increased force against the undersides of the caps. The suspended matters are thus arrested or precipitated and fall downwards. If desired, the improved interconnected caps may be used in combination with the tubular and parallel projections described in the earlier specification. The apparatus is equally applicable to other and similar treatment of gases and vapours—such as condensation.

Gas-Motors.—Bellamy, A. R., of Stockport. No. 17,726; Sept. 2, 1899.

This invention has for its object to so arrange the various valves as to dispense with the usual ports leading from such valves to the cylinder.

Fig. 1 is a vertical section of the cylinder-end of such an engine casting. Fig. 2 is a side elevation, looking in the direction of arrow in fig. 1. Fig. 3 represents a vertical cross section of the cylinder-end, taken at right angles to fig. 1.



The cylinder-end casting is arranged to carry the air-valve A, exhaust-valve B, and gas-valve C—the air-valve and exhaust-valve being vertically disposed, one opposite the other, as shown. The spindle of the air-valve is carried in a plug secured to the cylinder-end casting; the valve itself finding its seat against the interior of the combustion-chamber D of the cylinder, and being held thereto by means of a spring, as usual. The pendent exhaust-valve B, which is of any suitable description, is inserted in the cylinder-end casting, and lies opposite to the air-valve A; the outer wall of the valve being kept cool by passing through the water-jacket E to the interior of the combustion chamber. The gas inlet-valve C, which is preferably self contained, as shown, is arranged horizontally in the cylinder-end, and leads into the air-valve chamber at right angles to a line drawn through the centre of the air-valve spindle.

With this horizontal arrangement of gas-valve, a hit-and-miss tappet G may be used, or a sliding wedge may be employed to act on the gas-valve spindle—the wedge being operated by the usual hit-and-miss tappet.

In order to obtain greater water-space on the outside of the combustion chamber, and at the same time reduce the surface of the combustion chamber in contact with the water, the interior face F of the cylinder-end, which constitutes one wall of the combustion chamber, may be of a curved or concave form, as in fig. 3.

Coin-Freed Apparatus for Gas-Meters.—Stansfield, A., of Oldham, and Meters Limited, of Manchester. No. 9026; May 16, 1900.

This invention relates to improvements upon the apparatus for which a patent was granted to Daniel Orme in 1893—No. 15,740; and in

carrying the invention into effect, a cam was fixed on a spindle in juxtaposition to a wheel driven from the meter mechanism (the wheel being loose on the spindle, and having an arm carrying a bowl which engages with the cam), the purpose of the mechanism being to give an endwise movement to the spindle when either the cam or the meter-wheel was revolved. The present invention relates to an improved method of actuating the cam by means of the rotation of the coin-receiver, and also to an improved method of forming the connection between the cam and the valve.

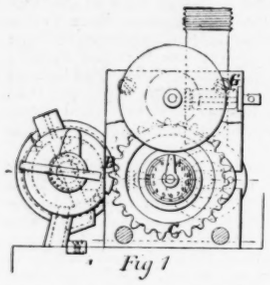


Fig 1

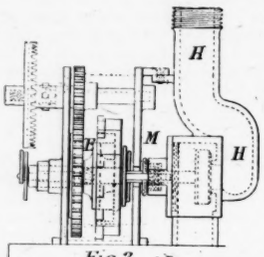


Fig 2.

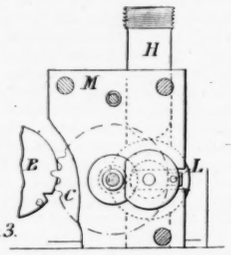


Fig 3.

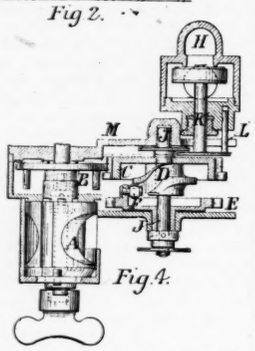


Fig 4.

As described in the earlier specification, a connection is formed between the coin-receiver A and the parts operating the delivery mechanism by means of the coin; the coin-receiver being free to rotate without producing any effect on the measuring or delivery mechanism when a coin is not in the receiver. A portion of the coin, when held in the receiver, falls into a claw formed on one end of the spindle on which the disc B is fixed. The spindle is sustained by the framing, in which it is free to revolve. The disc (constructed as shown) is fitted with two pins diametrically opposite to each other, which are respectively followed by gaps cut in the periphery of the disc. The wheel C—the "measuring wheel"—has two sets of teeth formed on its periphery; one set extending across the whole width of the wheel, and the other set being narrower but longer than the other teeth. The teeth are of the same pitch, but occur alternately on the periphery of the measuring wheel. The edge of the disc enters the path of the measuring wheel in the spaces between the wide teeth, as shown; and the pins project from the face of the disc so that, as it is rotated, they come alternately into contact with the long narrow teeth. When the disc is rotated, one of the pins engages with one of the long teeth, and rotates the wheel C through a definite angular distance; the gap passing over the succeeding wide tooth. When the movement of the disc is completed, and the coin discharged, the edge of the disc lies between two of the teeth, so that the disc B is locked, and the wheel C cannot be again rotated until a fresh coin is inserted.

The cam D is formed on the inner face of, and as part of, the measuring wheel which is fixed on the spindle J; the teeth of the wheel being wide enough to permit of the necessary endwise movement of the spindle. The meter-wheel E carries an arm; a pin and bowl F engaging with the cam course. The spindle J is borne by the framing of the machine, as is also the wheel E, the boss of which enters the framing and forms a bearing for the spindle. The wheel is prevented from moving endwise by means of a collar fixed on it, and having a small pin driven into it, and also into the boss of the wheel E. The latter is driven by a pinion fixed on a short spindle, on the other end of which a readily changeable crown-wheel is also fixed, so as to gear with a long pinion G, which has a protruding spindle by means of which it can be coupled to the meter-gearing in any suitable manner.

The valve fixed on the spindle K is borne as shown, and passes through a suitable stuffing-box. On the measuring-wheel spindle J is fixed a washer, and on the valve-spindle K a similar washer; the two washers (when the mechanism is in a working position, as in fig. 4) overlapping and closely adjoining each other. The inlet-pipe and valve-chamber H is fixed to the meter; and the back-frame M of the apparatus is provided with a slot, to permit the measuring mechanism to be slid inwards over the spindle K, so as to cause the washers to overlap each other, as in figs. 3 and 4. The result is that the coin-receiving and measuring mechanism can be removed and replaced while the inlet-pipe and valve-chamber H are left in working position. The first-named washer is provided with a small pin L, which slides in a hole in the valve-chamber, thus permitting the valve to slide, but not to rotate.

The Heckmondwike District Council and the Gas-Works.—The Heckmondwike District Council held a statutory meeting last Tuesday, to consider the advisability of jointly with the Liversedge District Council applying to Parliament for powers to constitute an authority for the acquisition of the Heckmondwike Gas-Works. A resolution identical with the one passed by the Liversedge Council on the previous evening, in favour of purchase, was carried unanimously. Mr. T. H. Gaunt, who said he was personally interested in the gas-works, strongly advocated the municipalization of such undertakings. The question will be submitted to the ratepayers of the respective townships.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Electric Lighting at Hastings.

Sir,—In the "Journal" for the 17th inst., I note a reference to the above matter in your "Electric Lighting Memoranda," and, in view of the interest therein shown in the matter, I would offer the following remarks from a local point of view.

Although the Local Government Board did not refuse the loan for the purchase of the electric light works at an exorbitant figure, as we had hoped, they were no doubt impressed by Professor Robinson's valuation of £40,000, and consequently granted £58,000 for the purchase for twenty years, and declined to allow the cost of transfer from the Company to the Corporation to be included as a capital charge. The balance of £253 odd at the credit of the net revenue account includes as one item "Unexpired insurance premiums, £153 16s. 2d." While, of course, this, from a financial point of view, is quite in order, it shows how desperate is the position of the department. Then, too, income includes £2377 8s. for current supplied to the Front-Line lamps; and, in addition, there is the current supplied to the public buildings, which our local people are artful enough to include under the heading of "Current sold per meter." The income from public lighting is particularly aggravating, since the amount above mentioned does not include repairs or renewals, which the ratepayers have to pay, bringing the cost per annum up to £2650, or exactly £50 per annum for the 53 lamps, half burning till midnight, and half all night. This, from your experience, you will know to be a most outrageous figure; and seeing that the electric light on the Front was originally adopted on a contract price of £1300 per annum; it is not a pleasant story to contemplate. Moreover, for lamps of practically the same description, except that two incandescents will be used after midnight instead of burning alternate arcs, the recent scheme puts the price at £13 to £14 each per annum; and the scheme has been adopted on these false pretences—depriving the Gas Company of legitimate custom. Then, too, last year the balance expended in excess of loss amounted to £14,045; and obviously interest and sinking fund on some, if not on all, of this was not made provision for.

Hastings, July 24, 1900. Chas. F. Botley.

Sir,—When I wrote you on the 24th inst., with reference to your notes of the 17th inst., regarding the above subject, it had escaped my notice that one of the local papers had taken the matter of your article up; and I yesterday, therefore, corrected the omission by forwarding you a marked paper. You will observe the article is said to be "inspired," and that the Press representative no doubt referred to the Borough Electrical Engineer or Chairman of Committee. I can leave it to you to prove what you say; and I now give you the following additional information.

From the analysis of the accounts for 1899, it appears evident that, unless the Company had received the same amount as the Corporation charge the ratepayers for the lighting of the public buildings and street-lamps, there would have been a loss on the year's trading. But, of course, it is well known locally that the Company when they sold were in the position that they could not raise money, and they were over-capitalized. This naturally meant (as Professor Robinson pointed out) that to bring the concern, with its plant, up to date, it would be necessary to write off, or reduce the capital, with naturally great loss to the shareholders—the share capital, indeed, only being about one-half the total "capital" of the Company.

At the purchase inquiry, the plant and mains were represented to be equal to work for some time to come; but this was altogether beside the mark. I cannot say absolutely that any plant has actually been "scrapped;" but the engines were extravagant in steam consumption, the station buildings were altogether unsuitable and indeed dangerous, and the system of mains involved a leakage account of about 35 per cent. These things, which the Company could not put in order, under the circumstances I have explained above, the Corporation have undertaken, with the result that the capital by the end of this year will have reached at least £100,000.

The Department must have been in desperate straits to show a profit on last year, as per my last letter; for further investigation shows that the capital expenditure in 1899 is charged with £450 12s. 3d., for Engineer's salary and sundry expenses. It appears that our Borough Electrical Engineer is fairly well paid as things go—receiving £450 per annum. I honestly believe the £450 of the above sum represents his whole salary for the year charged to capital; the 12s. 3d. being for "sundry expenses." This may be, as you will agree, defended as strict finance; but it shows a deplorable state of commercial success.

There is another point in regard to our local electric light scheming, which to those "in the know" is exasperating. It happens as follows: The local Company, after three years, had enough of the Front Line arc lamp contract, and were able to place the Corporation in the position that they could demand their own price for a renewal of the contract, or force the Corporation to do this lighting themselves. The latter was decided upon; the Company's plant being then represented as the reverse of what it should be. As soon as the public lighting scheme was sanctioned, negotiations for the purchase of the whole undertaking were instituted, and finally brought to completion, as you know. But the Corporation did not drop their public lighting scheme; and thus they defended the policy of having two separate stations, as being recommended to them by a competent Electrical Engineer, and as economical. It is really astonishing what town councillors will swallow when they have the electric light mania badly. On taking over the lighting of the Front Line with the separate station, the Corporation had to pay the Company practically as much for the old lamps and cables as they could have erected new ones for; and besides they renewed, at the ratepayers' expense, nearly the whole of the lamps and the cables, which it was suggested at the time had only been put in to last three years. This pretty little scheme cost the town practically £9000; and as was inevitable to those acquainted with the subject from the first, the station has now been abandoned on the score of economy. The only return that the ratepayers of Hastings have at the present time for the £9000 of expenditure

is that one of the small engines is to be moved to the large central station, and Messrs. Babcock and Wilcox have taken back the two water-tube boilers in exchange for another one. Thus it would be fair to assume that the town has dropped £7000 or £8000 over this scheme, which I, as an individual with others, protested against from the first. Do you think there will ever be a remedy for such muddling?

Hastings, July 27, 1900. CHARLES F. BOTLEY.

The "Transactions" of the British Association of Water-Works Engineers.

SIR,—In the notice in the current issue of the "JOURNAL" of the recently published volume of "Transactions" of the above-named Association, you very properly call attention to the delay which has taken place in issuing it. I think it is only fair to the members, as well as to others interested in the Association, to state that the delay was due in the first place to the postponement of the winter meeting until February of this year. The most serious cause, however, was the receipt, at a very recent date, of some valuable notes from Dr. Kemna, of Antwerp, supplementing his paper on "The Biology of Sand Filtration." It was thought that to give these additional notes in the volume in which the paper itself appeared was sufficient justification for the delay in publication.

54, *Parliament Street, S.W.*, PERCY GRIFFITH, Secretary.
July 25, 1900.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bill read a second time and committed: Paisley Water-Works Provisional Order Confirmation Bill.

Bill reported: Paisley Water-Works Provisional Order Confirmation Bill.

Bills reported, with amendments: Gaslight and Coke, Commercial Gas, and South Metropolitan Gas Companies Bill [New title, "Metropolis Gas (Prepayment Meter) Act, 1900"], Mid-Kent Water Bill, Rickmansworth and Uxbridge Valley Water Bill.

Bills read the third time and passed: Bradford Corporation Bill, East London Water Bill, Rickmansworth and Uxbridge Valley Water Bill, South Metropolitan Gas Bill, Wandsworth and Putney Gas Bill.

HOUSE OF COMMONS.

Thursday, July 26.

THE EXPORT OF COAL.

Mr. HARWOOD asked the First Lord of the Treasury if his attention had been called to the fact that the exports of coal from this country to France had increased during the last two years from 2,670,000 tons to 4,230,000 tons for a period of six months.

Mr. FIRBANK also asked whether the right hon. gentleman's attention had been called to the supplies of coal which were daily being shipped to foreign countries for storage for naval purposes; and whether, as the Government were bringing in a Bill to check the exportation of arms, ammunition, and military and naval stores from Great Britain, he would consider the desirability of extending the provisions of the Bill to include so important a munition of war as steam coal for foreign navies.

Mr. BALFOUR: I believe the facts as regards the export of coal are as stated. The Bill which awaits third reading in the House of Lords does apply to coal as well as to other naval and military stores.

Friday, July 27.

THE EXPORT OF COAL.

Sir H. VINCENT asked the President of the Board of Trade if his attention had been called to the rise in the price of coal; whether he had any official information to show that this result had been brought about by the increase in the purchases of coal, by foreign competition, or by the laying in of stocks by foreign navies; and whether he proposed to take any steps in the matter in the interests of the home population and of the defensive requirements of the United Kingdom.

Mr. RITCHIE: The price of coal exported in the first half of 1900 is considerably higher than in the year 1899, but not so high as in 1873; the figures being 15·87s. in 1900, 10·71s. in 1899, and 20·90s. in 1873. It is not practicable to apportion the recent rise in price among the various causes which have contributed thereto. With regard to the last question, the Government, while alive to the considerations referred to by my honourable friend, are not prepared at present to make any proposals to Parliament in the direction indicated by my honourable and gallant friend.

Sir H. VINCENT: Will the right honourable gentleman state to what countries the coal exported mainly goes?

Mr. RITCHIE said he would be glad to do so if a question were put down on the subject.

The following further progress was made with Private Bills last week:—

Lords Bills reported, with amendments: Morley Corporation Bill, Salford Corporation Bill.

Lords Bills read the third time and passed: Barnsley Corporation Bill, Bury and District Water (Transfer) Bill, Rotherham Corporation Bill, Walsall Corporation Bill.

The notice placed upon the paper by Sir Albert Rollit, in reference to the increase in the price of gas by the Gaslight and Coke Company, now stands under the heading of those given for next session, as well as among the notices for which no dates have been fixed.

On the order for the consideration of the Borough Funds Bill, as amended by the Standing Committee being read, the Bill was withdr awn.

THE PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

The Joint Committee of the Houses of Lords and Commons on Municipal Trading (see *ante*, p. 226) met again last Tuesday, under the presidency of the Earl of Crewe; the other members present being Lord Windsor, Sir W. Foster, Sir W. Dunn, Mr. Grant Lawson, and Mr. Lewis Fry.

The Earl of Morley, Chairman of Committees in the House of Lords, gave evidence as to the procedure of the House of Lords so far as it touched the sphere of the inquiry. When the session began, he said, he went through every Bill with the promoters, and argued any point that arose. These interviews with promoters were entirely private; the object being to facilitate the progress of Bills in both Houses, and to save cost and trouble to promoters by getting the amendments he thought necessary introduced in the First House. If any important question of principle arose, he consulted the Chairman of Ways and Means in the House of Commons; and if the matter was very important indeed, the head of the Government Department concerned sometimes came to see him. He was, of course, merely the agent of the House of Lords; and his decisions he considered to be the decisions of the House of Lords. The question whether corporations should be allowed to work tramways was very much discussed in 1892. The decision in favour of giving the corporations the power could only be arrived at by an alteration of the Standing Orders; so that both Houses had ample notice of what was being done. When smaller matters arose—such as the manufacture of fittings for electric or gas work—he dealt with them himself. The vote on the manufacture of fittings had been inserted in Private Bills for the last two years. He consulted several experienced gentlemen who came before him in regard to the promotion of Bills; and they all said that they did not want power to manufacture at all. He did not quite agree with a former witness, who said that it would be easy when a corporation bought up a company to cut out any power to manufacture which the company might possess. The undertaking would be purchased as a whole; and the power to manufacture would affect the terms of purchase. The Chairman said the Committee had had complaints that local authorities—particularly small ones—had obtained Electric Lighting Orders, and had not used them. Witness replied that he had heard the same thing casually. He thought that the Clauses Bill of 1899 embodied exactly the practice enforced by the Board of Trade up to that time. This measure gave the Board of Trade power to revoke a Provisional Order after a certain time; but he fancied the power had been very sparingly used. It would be far better that there should be a limit of time put on the completion of the works; and that if at the end of this time the local authority sought power to extend the period, it should be extended. Witness did not think that it should go on indefinitely. The effect of this would be that at the end of the stated period, the local authority requiring an extension would have to give distinct reasons for it. They would have to review the circumstances of the case; and if they gave good reasons for the extension or modification, it would be granted. If not, they must make way for someone who would. At present, it depended on the Department saying: "Why have you not so far utilized your Provisional Order?"

Sir Robert Hunter, Solicitor to the Post Office, explained the legal position of the Post Office with regard to the National Telephone Company, in the matter of the opening of streets in Glasgow; and Mr. J. W. Benn gave evidence respecting the working of the tramway system under the London County Council.

At the meeting of the Committee on Friday, Mr. G. Briggs, Managing-Director of the Shap Granite Company, of Westmorland, representing a number of manufacturers of concrete slabs, protested against the way in which certain corporations are competing with such manufacturers by means of paving material made out of the refuse from destructors. Mr. Maxwell, the President of the Scottish Co-operative Wholesale Society, Limited, having its head-quarters in Glasgow, expressed his satisfaction with the manner in which the Corporation of the city had conducted their various undertakings. Mr. E. L. Gaine, General Manager and Solicitor of the National Telephone Company, replied to some of the evidence given by the Lord Provost of Glasgow with reference to the Glasgow telephone service, and the sitting closed.

It is understood that no further evidence will be taken.

Gas Explosion in Manchester.—Last Wednesday morning, about two o'clock, an alarming explosion occurred in Tib Street, Manchester. Near the hour named, the pavement flags outside the hat and cap manufactory of Mr. Peter Johnson were lifted into the air by an explosion. In a few minutes the Fire Brigade were on the spot, and it was found that the flames had travelled underneath the warehouse, melting the gas-pipes and causing a large quantity of gas to escape. A series of minor explosions followed; and fearing more serious consequences, four firemen were sent to the basement of the premises to cut off the gas at the meter. The basement was full of gas, and the firemen were overpowered—some difficulty being experienced by their comrades in rescuing them. Meanwhile the flames threatened to set the building on fire; but by turning off the gas at the main, this was fortunately averted.

Fatal Fire at an Oil-Gas Works.—Last Tuesday afternoon, a fire occurred in the oil-gas works belonging to the Great Central Railway Company, near the Victoria Station, Sheffield. Operations were going on as usual when there was a loud report in the neighbourhood of the five storage-tanks, and the works were quickly on fire. One of the workmen, apparently heedless of the risk he ran, made an attempt to shut off the steam. He succeeded, but at the cost of his life, as he was overpowered by the escaping gas, and his charred remains were found after the fire had been extinguished. The cause of the outbreak can only be surmised; but it is thought that an explosion occurred in the engine-house, perhaps through the melting of some lead piping, and the gas which leaked made its way to the retort-house, and was there ignited. The works have been in existence for something like thirteen years, and are built on similar lines to those at other large centres along the line.

LEGAL INTELLIGENCE.

THE MANUFACTURE OF WATER GAS AT HORSHAM.

Alleged Nuisance.

At the Horsham Town Hall last Saturday, the hearing of a summons taken out by the Horsham Urban District Council, under section 114 of the Public Health Act, 1875, charging the Horsham Gas Company with permitting noxious smells to escape from their works, came before the Magistrates (Mr. R. H. Hurst, Chairman, and Colonel St. John).

Mr. C. J. B. HURST represented the Council; Mr. G. F. HOHLER appeared for the Company.

Mr. HURST, in opening the case, said in the summer of last year the Gas Company, for the purpose of improving the quality of their gas, started making carburetted water gas; and almost immediately the residents in the parts of the town near the works began to complain of a nuisance caused by the horrible effluvia escaping therefrom. On Sept. 15 a memorial signed by 46 of the inhabitants was sent in to the Council, who went into the affair, and on the 22nd of September brought the matter before the Gas Company. The Company replied that they were sorry to hear of the complaints with regard to their new works, at the same time saying that the carburetted water-gas plant was guaranteed by the makers to be entirely free from any offensive smell, and that, by introducing the new process, it was anticipated that the smell which necessarily arose from the old process of manufacture would be abolished. Their object was to give their consumers an improved quality of gas; and they were pleased to state that the improvement had been acknowledged throughout the district. For a short time the smell caused by the works entirely ceased; but it began again in October, when the matter was again brought before the Council. All through the early months of this year, there was no appreciable abatement in the intensity of the smell created by the new works; but a verbal assurance was received by the Council from the Chairman of the Company that they had the matter under consideration, and were conferring with their Engineers as to the best steps that could be taken to abate the nuisance. Thus matters went on until June. The Company had raised their iron smoke-stack some 6 or 10 feet; but this had had no effect. Nothing had been done to purify the noxious fumes, or to reduce the amount. It was a significant fact that the Company had been manufacturing gas in the district for some forty years; and it was not until the erection of the new plant that any cause for complaint had arisen.

Dr. *Kinnear*, a surgeon, residing within 80 yards of the works, deposed that he had suffered inconvenience from the new works owing to the smell that was emitted, a humming noise caused by the machinery, loud explosions, and fires in the chimney shaft. The smells were as bad as ever after the raising of the chimney. Besides the fumes from the chimney, he had also observed smoke coming through the roof of the building. They were penetrating, suffocating fumes, which filled the house and caused headache and a feeling of sickness.

Cross-examined: He had attended patients for sickness caused by the fumes. He had never seen the Gas Company's people on the matter. What he had seen of the gas-works was enough for him. The fumes were darker than one would expect from a coke-fire. He had got used to the smell from the old works, which was entirely different to the present effluvia. He purchased his house last spring. If the nuisance had existed then, it would have made a great difference in the price that he should have paid.

Several other residents of Horsham, living more or less adjacent to the works, gave their experience of the fumes coming from the gas-works since the new works had been erected.

Mr. HOHLER then opened the case on behalf of the respondents, and submitted that the evidence which had been given on behalf of the applicants as to the alleged nuisance had been greatly exaggerated. He then described at length the process of making carburetted water gas, which, he said, had been carried on throughout the country in large towns without complaint. The Company had complied with the provisions of the Act in carrying on their works in the best possible manner, and, in fact, no nuisance had been caused.

Mr. *Corbet Woodall* deposed that he had been consulted with regard to the erection of plant for the manufacture of carburetted water gas since its first introduction into this country. The gas was made by the decomposition of water; and it was enriched so as to have an illuminating value by means of petroleum oil. Coke was put into the first chamber, the generator, which took the place of the ordinary retort in a gas-works, and was lighted; the depth of the fuel being about 4 feet. When it was lighted, a stream of air was blown through it, and the effluent gases from the decomposition of the coke were carried forward into the carburettor and the superheater. These were filled with checkered brickwork, which was raised to a bright heat; then the supply of air was turned off, the effluent valve from the last of the chambers was shut, and the steam turned on into the generator. Then there was a close communication from the generator right through into the gasholder. Steam was put into the base of the generator, and coming in contact with the coke the steam was broken up, the oxygen set free, and the hydrogen coming in contact with the coke made carbon monoxide. These two together went into the carburettor, and then oil which had been raised to a high temperature was driven in to mix with them. The water gas with the oil vapour went down through the hot carburettor, and afterwards rose through the superheater. In this process, the oil became fixed as a permanent gas, so that it would not deposit again in the pipes when it was subjected to a low temperature. This completed the system of manufacture. While the process was going on, white steam was being driven into the hot coke. At the end of 5 or 6 minutes, the temperature of the coke was too low to allow of the proper generating of the gas, and then the steam was shut off, and the valve on the chimney stack opened. Then the valve was opened again, air driven in so as to raise the coke to the necessary temperature, and the process repeated. Before the change took place, it was necessary to drive out of the chambers the whole of the oil that had been used for the purpose of enriching. If this were not done, it was possible that there might be a smell from the chimney. The opening and shutting of the valve had to be operated by a man in attendance; it was not self-operating. The man had a clock in front of him by which he regulated the opening and shutting of the valves at stated intervals. Witness visited the works, and was able to say that the apparatus was thoroughly good; it was well designed and well built; it was kept in proper order; and, so far as he could see, the operator was an intelligent man, and understood the apparatus. He had seen the apparatus at work, and was unable to detect any smell, either inside or outside the works. The only practical means he could suggest for abating the nuisance, if there were any, would be to carry the chimney up higher. If the same quantity of gas were to be made under the old system, it would cause a greater nuisance. The gas coming from the flue would be largely nitrogen, some carbonic acid, and possibly a little carbonic oxide. There would also be a little sulphurous acid, due to the sulphur in the coke used in the generator. These were simply the ordinary products of the combustion of coke. The nuisance caused by clearing out the purifiers was considerably modified by this process, because the quantity of sulphur carried forward by the gas was much less than in the manufacture of coal gas. The necessity of pouring water on the coke when drawn from the retort was also done away with.

Cross-examined: The carburetted water gas was not made exclusively for the purpose of enriching coal gas, because, at the present price of coal, it could now be made cheaper than ordinary coal gas, besides being less objectionable. The amount of sulphur fumes would depend upon the amount of sulphur in the coke. The use of a pure carbon in the generator would render the product entirely free from all sulphur fumes. Oven coke contained less sulphur, but was altogether unsuited for this process, because it would not retain its temperature in the same way that gas coke did. The smoke that was seen coming through the roof was no doubt caused by water being poured on the clinker drawn from the retorts to quench it. Knowing the apparatus as he did, and having seen it in operation, he could say that there was nothing to cause the smells which had been complained of; but, of course, if there were neglect, a smell might be made, as with every other apparatus. No nuisance could arise from the steam that came through the roof from quenching the coke.

Mr. *E. D. Sapey*, the Manager of the Horsham Gas-Works, was next examined. He said he had been Manager at Horsham for sixteen years —having previously been at Littlehampton and Hong Kong. He had never perceived anything offensive from the working of the new plant, and considered it a great improvement on the old process. The men who worked the plant under his direction were all thoroughly competent to do the work. In consequence of the first complaints, the smoke stack was raised 21 feet; making the total height 51 ft. 6 in. He denied that any smoke could have been seen coming through the roof; it could only be vapour or steam caused by quenching the coke.

Cross-examined: No complaints had been made to him personally. The winter before the new plant was put down, the consumption of gas was fully up to the capacity of the old plant; and if they had not put down the new plant, they would have been in a difficulty in the future. He agreed that, with the present price of coal, the new method of making the gas was cheaper than the old; but that did not influence the Directors in causing the new method to be adopted. The coal used at Horsham was one of the best coals that could be got; the price was never taken into consideration, only the quality. He knew of no coke that had no sulphur in it. The best coal was not always used for the purpose of making oven coke. The advantages claimed for the new system were better illuminating power, and less room required to manufacture the same quantity of gas, besides which, the Gas Company were rendered independent of coal strikes. His comment on the evidence called by the applicants was that it was greatly exaggerated, and the result of imagination.

Mr. *W. J. A. Butterfield*, M.A., F.I.C., agreed with Mr. Corbet Woodall that the carburetted water-gas plant at Horsham was the best that could be obtained. The process of manufacture, as he had seen it carried out, was such as to cause the minimum of nuisance. The products discharged into the atmosphere from the shaft in question were the same as from any furnace or fire. He had analyzed the gases coming from the chimney, and found them to be ordinary chimney gases.

Cross-examined: He did not think the use of oven coke was at all practicable in the South of England. No doubt if the shaft were still further heightened, it would diminish the risk of nuisance being caused; but, in his opinion, the Company had already raised their shaft higher than was necessary considering the size of the works.

Re-examined: His analysis of the effluent gases showed 13·5 per cent. of carbonic acid, 5·5 per cent. of carbonic oxide, and 0·2 per cent. hydrocarbons. The remaining gases were not estimated, but would be nitrogen and hydrogen, and sulphur dioxide 1 volume in 4025. This latter figure was very small. He should expect to find in most chimney gases as much as 1 volume in 2500.

Several residents were then called, and said that they had not noticed anything offensive coming from the Gas Company's new apparatus.

Mr. *Samuel Cutler, junr.*, a member of the firm of contractors who had erected the new plant, was then called. He said the chimney erected at Horsham was higher than at any works he had contracted for relatively to the size of the works. He had been at Horsham on several occasions, and denied that there were any smells emitted from the works. If there were, it would not be consistent with proper working of the plant. The capacity of the plant at Horsham was a make of from 125,000 to 150,000 cubic feet.

At the conclusion of the case, which had lasted five hours, the Chairman announced that they found there was evidence of a nuisance arising from the new works, but that they suspended the final determination of the matter for the period of three months, on the condition that the Gas Company undertook to raise the shaft to such a degree as would be sufficient to abate the nuisance.

The Welsbach and Sunlight Settlement.

In the Chancery Division of the High Court of Justice yesterday, before Mr. Justice Buckley, the case of the Kern patent No. 294 of 1897 was down for judgment. Mr. Bousfield, however, said that since the matter was last before the Court, the Sunlight Company had held their meeting, and the arrangement provisionally come to between the parties

had been confirmed. Under these circumstances, he asked his Lordship not to deliver judgment. He thought the better plan would be to withdraw the petition for the revocation of the patent. Mr. Moulton suggested that the action should be discontinued, without costs. He also mentioned that the mantle action had been settled. Mr. Bousfield said the better plan would be to withdraw the petition, without costs. Mr. Moulton added: "And, by consent, discontinue the action, without costs." His Lordship assented to this course being adopted.

Compensation for Injuries Caused by the Explosion of a Gas-Meter.

At the Belfast Assizes on the 21st inst., Daniel Gracey and his wife, Sarah Gracey, of 33, Palestine Street, Belfast, sought to recover from the Belfast Corporation £650 damages for injury to person and property, alleged to have been the result of negligence on the part of defendants and their servants. It appeared from the evidence that on returning home one Saturday evening Mrs. Gracey detected a strong smell of gas, and spoke about it to her husband. He struck a match, and a violent explosion occurred. The plaintiffs were both seriously injured, and considerable damage was done to the furniture in the house. The explosion resulted from an escape of gas through the overflow chamber of the meter, the cap having been left off by the Corporation inspector who put the water into the meter. The escape, it was stated, was more immediately caused by the high pressure of gas necessary on Saturday evenings for the lighting of shops. The defence was that the meter was not under the control of the defendants or their servants, and that the explosion was caused through the negligence of the plaintiffs. After hearing evidence, the Jury found for the plaintiffs, with £68 10s. damages.

The Alleged Theft of Water from the East London Company.

At the Central Criminal Court last Thursday, Joseph Holland, on bail, was indicted before the Recorder for stealing 900,000 gallons of water belonging to the East London Water Company. Mr. C. F. Gill, Q.C., and Mr. Arthur Gill prosecuted; Mr. Purcell defended. The accused, who was a builder, was engaged in erecting houses at Leytonstone, and for some of these houses he had arranged with the Company for a supply of the water required. It was alleged that after some of the houses had been erected the accused surreptitiously obtained the water he needed for erecting another block of houses. The hearing of the charge extended to Friday morning, when it was stated that one of the jurors had informed the Court that he had a case of diphtheria in his house. The Recorder upon learning this adjourned the further hearing until next sessions; the defendant being allowed bail.

The Oystermouth Water Company Fined.

At the Swansea Police Court last Wednesday, the Oystermouth and District Water-Works Company were summoned on the information of Mr. Villiers Meager, barrister, for neglecting to furnish him with a supply of water for domestic purposes at his residence, West Cross, after information of the need of it had been duly tendered. The proceedings were taken under section 43 of the Water-Works Clauses Act, 1847. The complainant deposed that he paid his water-rates regularly, and was consequently entitled to a supply of water. He had lived at Coehir for 18 months, and during his occupation of the house there had been practically no water supply. He had lodged written complaints at least a dozen times. For the defence, Mr. Clason Dahne contended that the Company were not bound to supply the highest house in the neighbourhood, which Mr. Meager's certainly was. The Bench found that there had been no supply on the 19th of July; and a penalty of £10 was imposed—defendants to pay also £2 for every day since upon which water was not supplied.

Another Water Waster Fined.

At the Ipswich Police Court, on Monday last week, Mr. George L. L. Warren, of 61, Victoria Street, was charged with suffering the fittings, &c., of a water-closet cistern to be out of repair at 21, White Elm Street, and a tap to be defective at No. 25 in the same street. Defendant pleaded guilty, and said he meant to do the repairs, but they had slipped his memory, as he had so much to do. Mr. W. Bantoft said notices to repair were served on defendant a number of times, but he had taken no notice of them. Mr. Hamlet Roberts, Manager of the water-works, said the waste of water at No. 21 was 300 gallons per hour—an amount which would have supplied 360 persons for a day. At No. 25, the waste was 300 gallons per day. Defendant had been previously convicted for similar cases, and he was now fined 30s., and 8s. 6d. costs, in each case.

New Buildings for the Manchester Gas Department.—On Monday last week, the foundation stone of the new buildings which are being erected in Poland Street, Manchester, by the Street Mains Sub-Committee of the Corporation Gas Committee, was laid by Alderman Gibson, the Chairman of the Committee. The scheme is in two sections. On the right-hand side of the entrance are a general office, store-room, workshop, and shed for testing mains by hydraulic pressure; and on the left the storekeeper's house, mess-room for fifty men, and stables. The cost is estimated at £13,000. Alderman Griffin, the Chairman of the Sub-Committee, presided. On behalf of the Architect (Mr. Joseph Swarbrick), he presented Alderman Gibson with a trowel and mallet with which to perform the ceremony. In doing so, he said it was apparent to even a casual observer that the extension was one of necessity. The outlay needed, though large, would, he believed, adequately repay the ratepayers. An important feature was the accommodation to be provided for the horses. Alderman Gibson then declared the stone well and truly laid. The ground they were standing on, he said, had been the property of the Corporation for the last forty years, and he believed that in the first instance the purchase-money was £1400. An important part of the scheme was the provision to be made for testing mains. When they knew that a leakage of 1 per cent. of gas meant a loss to the ratepayers of £5000 a year, they would understand the value of this department. He was glad also a mess-room for the workmen was to be provided.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report and Accounts.

The following is the report on the working of the Company in the six months ending June 30, which, with the accounts for this period, will be submitted to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance available for distribution of £626,602 13s. 11d., out of which the Directors recommend a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, carrying forward the sum of £296,755 0s. 11d. to the credit of the current half year.

The sales of gas have increased during the half year at the rate of 3·3 per cent. This represents an addition to the quantity of gas sold in the June half year of 1899, of 359,524,000 cubic feet.

The increase in the price of coal, to which the Directors have adverted in their last two half-yearly reports, has been fully maintained, and there is, unfortunately, no evidence of any immediate reduction in market quotations. The Directors have completed contracts for the purchase of the Company's requirements up to June 30, 1901, at the very serious advance in price of 8s. per ton, which will entail an additional charge against revenue, for the year, of £800,000.

The Directors have reason to believe that the present prices of coke and other residual products will be maintained for some time longer; but the additional revenue from this source represents only one-fourth of the extra cost of coal.

Under these circumstances, the Directors have, with great regret, and in common with the other Metropolitan Gas Companies, been obliged to give notice of an increase in the price of gas per 1000 cubic feet, such increase in the case of this Company being, to private consumers north of the Thames, as from June, at the rate of 6d., or a net increase of 5d. having regard to the reduction of 1d. made to them in January last; and (following upon increases made by the South Metropolitan Gas Company), to Local Authorities for street-lamps and to private consumers south of the Thames, an increase of 3d. as from March and a further increase of 4d. as from June.

The proprietors are fully acquainted with the provisions of the sliding-scale clauses of the Company's Acts, and will have therefore been prepared for the reduction in the rate of dividend of 10s. per cent., or 2s. per cent. for every 1d. of the net increase of 5d. per 1000 cubic feet in the price of gas since last year to private consumers north of the Thames.

The action of the Directors in raising the price of gas has been criticized by Local Authorities and others, who have evidently failed to appreciate the fact that, under present legislation, the consumers of gas cannot be subjected to an increase in the price they have to pay without the proprietors of ordinary stock being at the same time subjected to a corresponding reduction in the rate of their dividend.

It is with regret that the Directors have to announce that the Company's Bill for further capital powers, to which reference was made in their report of January last, and which had been drawn up with a view to secure, in the interests of the consumers, the raising of the necessary capital at the lowest possible rate, was, on the 18th of May last, rejected by the Committee of the House of Commons.

The Bill promoted by the London County Council for legalizing the use of portable photometers, and for regulating the supply of prepayment meters and fittings, was opposed by the three Metropolitan Gas Companies. That portion thereof relating to portable photometers was rejected; while clauses were agreed to between the Companies and the Local Authorities which fixed the price to be charged for the use of prepayment meters and fittings. The Bill embodying these clauses now awaits consideration by a Committee of the House of Lords.

In the report presented to the proprietors in January last, reference was made to the negotiations which had been carried on with the South Metropolitan Gas Company for the sale to them of the Company's district of supply south of the Thames, together with the works at Nine Elms and Battersea. The Directors have now to report that these negotiations resulted, on the 29th of June, in a provisional arrangement between the two Companies for such sale, and the South Metropolitan Company had then before Parliament a Bill, which had passed the House of Commons, containing provisions for giving effect to such sale. The Committee of the House of Lords, however, when considering this measure, declined to sanction that part of it which had reference to the sale, and thus the endeavours of the two Companies to give effect to one of the principal recommendations of Sir James Rankin's Committee of 1899 have been rendered fruitless.

The Court of Directors has been furnished by the several Engineers of the manufacturing and distribution departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

Accompanying the report are the usual statements of account, from which we take the following particulars:—

The statement of capital (stock) on June 30 stands as follows: Total paid up, £9,216,500; added on conversion, £12,176,490; unissued, £250,000—total amount authorized, £21,642,990. The statement of loan capital stands thus: Total paid up, £2,644,000; added on conversion, £1,479,975; unissued, £200,000—total amount authorized, £4,323,975. The total stock and loan capital is therefore £25,966,965, of which £25,516,965 has been paid up.

The capital account shows receipts (with premiums, £1,603,050) to the

amount of £27,120,015. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1899		£12,824,855 3 9
Expenditure during the half year to June 30, 1900, viz.:—		
Buildings and machinery in extension of works	£14,706 13 0	
New and additional mains and service-pipes	22,972 19 4	
Do. do. meters	18,580 14 1	
Do. do. stoves	20,633 8 0	
	£76,893 14 5	
Cr. by sale of surplus land	8,203 2 4	
		68,690 12 1
Total expenditure		£12,893,545 15 10
Nominal amount added on conversion		13,656,465 0 0
Balance of capital account		570,004 4 2
		£27,120,015 0 0

The revenue and net revenue accounts are given in full below.

The balance available for division is £626,602 13s. 11d.; and the statement showing how the Directors propose to appropriate it is as follows:—

June, 1899.		
£53,759 ..	Net balance brought from last account	£193,333 8 4
453,129 ..	Net revenue for the half year	433,269 5 7
£506,888		£626,602 13 11
(£4 18s. per cent.)	A dividend on the ordinary stock—	
£367,330 ..	£4 8s. per cent. per annum on £14,993,075	329,847 13 0
£139,558 ..	Balance carried to next account	£296,755 0 11

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on June 30 were as follows: Reserve fund, £51,902; insurance fund, £84,603; and depreciation fund, £55,204. The insurance fund had to bear in the past half year a sum of £70 2s. 4d., the value of plant destroyed by fires in the Company's district.

REVENUE ACCOUNT.

Dr. Cr.

June. Half Year, 1899.		£ s. d.	£ s. d.	June. Half Year, 1899.		£ s. d.	£ s. d.
	To Manufacture of Gas—				By Sale of Gas—		
	Coals, including oil, dues, carriage, unloading and trimming	883,451 3 9		£1,534,765	Common gas, per meter, at 2s. 11d., 2s. 1d., & 2s. 4d. per 1000 cubic feet	1,554,206 0 2	
£682,741	Salaries of engineers and other officers at works	14,663 5 7		74,353	Public lighting and under contracts— Common gas	75,228 8 8	
14,284	Wages, carbonizing £174,194/4/3			£1,609,118			1,629,434 8 10
161,548	,, sundries £16,707/13/5	190,901 17 8		21,325	Rental of stoves	..	23,784 9 2
16,567	Purification, including £18,459/15/8 for labour	41,633 0 11			Residual products—		
34,677	Repair and maintenance of works and plant, materials and labour, less received for old materials,			£286,750	Coke, less £45,565 4s. 7d. for labour, &c.	387,832 6 2	
	£5481 8s. 7d.	168,599 13 5		8,846	Breeze, less £2,528 12s. 4d. for ditto	13,196 9 11	
180,054	Distribution of gas—		1,249,252 1	60,673	Tar and tar products	92,421 6 6	
	Salaries and wages of Officers (including Rental Clerks)	35,658 8 9		82,462	Ammoniacal liquor and sulphate of ammonia	100,021 4 5	
33,343	Repair and maintenance of mains and service-pipes	35,775 9 7		£438,231			592,971 7 0
41,884	Repair and renewals of meters	24,588 5 5		£4,680	Rents receivable		4,662 17 0
25,117	Stove fixing, repairs, and renewals	29,863 1 6		261	Transfer fees		257 5 0
27,820	Gas fittings (auto. meter supplies).	26,574 16 9					
..			152,459 17 0				
16,518	Public lamps—Lighting and repairs	..	18,150 15 4				
	Rents, rates, and taxes—						
6,113	Rents payable	6,135 18 0					
112,915	Rates and taxes	120,171 18 0					
	Management—		126,307 16 0				
2,750	Directors' allowance	2,750 0 0					
229	Company's Auditors and Assistant	235 14 0					
11,714	Salaries of Secretary, Accountant, and Clerks	11,131 18 6					
20,326	Collectors' commission	20,638 18 9					
6,735	Stationery and printing	7,118 2 2					
4,120	General charges	3,508 10 3					
			45,383 3 8				
2,963	Parliamentary charges	..	5,424 16 8				
1,253	Law charges	..	662 0 8				
	Charges *re* Quinquennial Re-valuations	..	2,000 0 0				
5,253	Bad debts	..	5,571 4 1				
500	Depreciation fund	..	500 0 0				
13,194	Annuities	..	14,262 5 5				
2,500	Workmen's Compensation Account	..	886 19 6				
	Public Officers—						
879	Gas Referees and Official Auditor.	875 16 4					
1,129	Public testing-stations	1,354 17 2					
			2,230 13 6				
£1,425,606			1,623,091 13 2				
648,009	Balance carried to net revenue account		628,018 13 10				
£2,073,615			2,251,110 7 0	£2,073,615			2,251,110 7 0

NET REVENUE ACCOUNT.

Dr. Cr.

June. Half Year, 1899.		£ s. d.	£ s. d.	June. Half Year, 1899.		£ s. d.	£ s. d.
£65,660	To Interest on debenture stock and bonds, accrued to June 30, 1900	..	66,479 12 6	£416,426	By Balance from last account	560,563 15 1	
	Dividend on the preference stocks—				Less dividend on the ordinary capital		
75,995	4 per cent. consolidated	75,994 14 0		362,737	for the half year to Dec. 31, 1899	367,330 6 9	
4	Convertible 5 per cent.	4 10 0					193,233 8 4
45,500	Dividend on the 3½ per cent. maximum stock	45,500 0 0		53,759			
			121,499 4 0	£48,009	Revenue account	..	628,018 13 10
7,721	Interest on temporary loans & sundry funds		6,810 11 9				
506,888	Balance applicable to dividend on the ordinary stock.		626,604 13 11				
£701,768			821,352 2 2	£701,768			£821,352 2 2

The statements furnishing particulars as to working are as follows:—

STATEMENT OF COALS USED, Etc.

Description of Coal.	In Store, 31st Dec., 1899.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 30th June, 1900.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	143,705	996,851	1,017,346	2,125	121,085
Cannel	17,415	6,317	*14,801	..	8,931
Total	161,120	1,003,168	1,032,147	2,125	130,016

* In addition to this quantity of cannel, 4,709,623 gallons of oil and spirit have been used during the half year.

STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 31st Dec., 1899.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 30th June, 1900.
Coke—tons	35,531	640,378	142,893	506,788	26,228
Breeze—tons.	4,233	73,398	16,751	58,775	2,105
Tar—gallons	1,048,202	10,414,684	10,528,241	18,018	916,627
Ammoniacal liquor—butts	27,148	287,656	295,753	..	19,051

STATEMENT OF GAS MADE, SOLD, Etc.

Quantity Made.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Total Quantity accounted for.	Number of Public Lamps.
Thousands.	Thousands.	Thousands.	Thousands.	
*12,040,775	535,868	10,716,358	11,415,779	51,996
†11,557,809	533,260	10,359,442	11,058,119	52,362

* Including 1,539,811,000 feet of "oil gas." † June half year, 1899.

The last statement is the general balance-sheet. It shows that the value of the stores on hand on June 30 was as follows: Coals, £96,510; coke, £18,692; tar and ammoniacal liquor products, £99,007; sundries, £277,962—total, £492,171. The figures for the corresponding period of 1899 were: Coals, £94,029; coke, £14,489; tar, &c., £78,402; sundries, £282,570—total, £469,490. The item "automatic meter supplies (balance of fittings account)" amounts to £254,191, as compared with £298,556 at the close of the six months ending June 30, 1899.

PREPAYMENT METERS.

CHANGING PRICE.
MOST SIMPLE.
NO WHEELS OR
PARTS REQUIRED.

THIS METER CAN BE ALTERED *in situ.*

INSTRUCTIONS.

The Brass Plate has holes around its edge, numbered; these indicate the feet delivered for the Coin used.
To set the Meter, note Figs. I., II., III., IV.

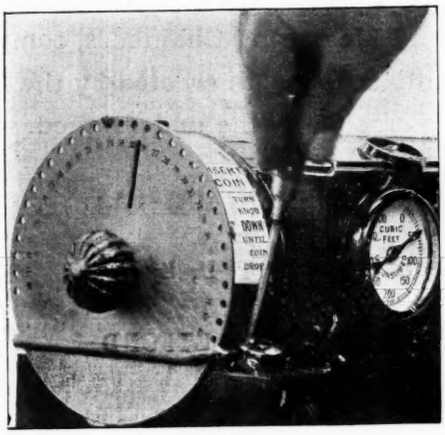


Fig. I.
Break Company's Seal and Remove Screw—THUS.

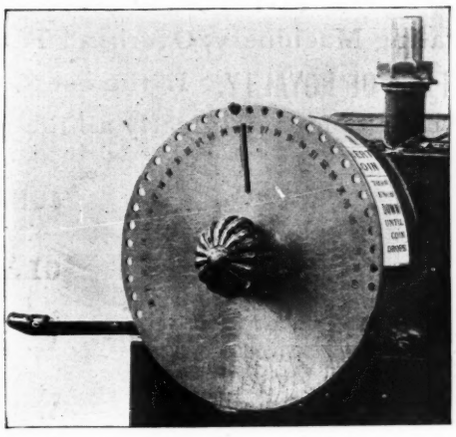


Fig. II.
Swing Band Back—THUS.

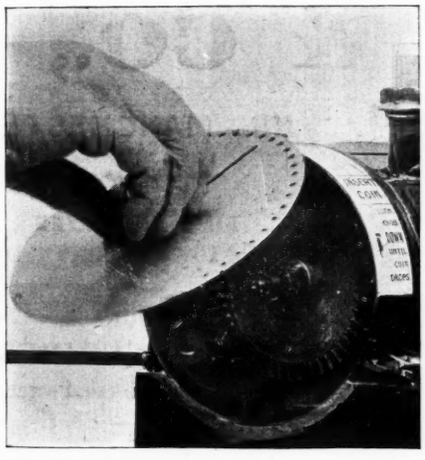


Fig. III.
Lift Plate Off—THUS.

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re-seal.

NOTHING SO EASY. NOTHING SO ACCURATE.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

BRISTOL:
28, BATH STREET.
Telegraphic Address: "*GOTHIC.*"
Telephone No. 1005.

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "*GOTHIC.*"

MANCHESTER:
37, BLACKFRIARS STREET.
Telegraphic Address: "*GOTHIC.*"
Telephone No. 3898.

GLASGOW:
69-71, McALPINE STREET.
Telegraphic Address: "*GASMAIN.*"
Telephone No. 6107.

A "NEEDFUL" EXPLANATION.

We note an Advertisement in the "JOURNAL," under the name of the NEW CONVEYOR COMPANY, stating that they had taken over the business of the AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED; and, as it may create a false impression, we beg to say there are **NO VALID PATENTS** existing in connection with Inclined Retorts (beyond a few small and subsidiary ones, dealing with details).

We are prepared to erect Inclined Retort Plants, with Conveying and Elevating Machinery, Overhead Tanks, Hoppers, and Measuring Chambers, complete and **FREE OF ROYALTY.** In the list of places given, only a few were erected by the New Conveyor Company—nearly all the remainder being erected by the undersigned.

JONAS DRAKE & SON, OVENDEN, HALIFAX.

GRAHAM, MORTON, & CO., LIMITED, LEEDS.

W. J. JENKINS & CO., LIMITED, RETFORD.

WINSTANLEY COMPANY, COVENTRY.

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

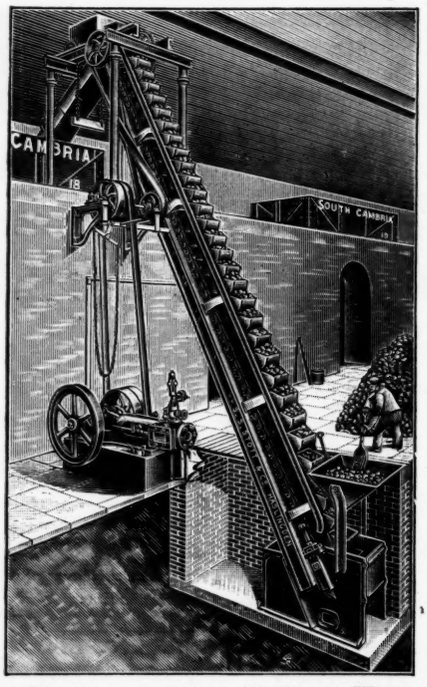
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

Coke Elevator Loading Railway Waggons.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ending June 30, which, with the accounts, will be presented at the half-yearly general meeting on the 8th prox. :—

History repeats itself—but with a difference. From 6s. in 1871, the price of gas coal went up to 20s. per ton, free on board in the Tyne, in 1873. This year it has advanced to 16s., or a little more—from 8s. last year, and 6s. 6d. or 6s. 3d. in 1897. But, in 1873, about two-thirds of the extra price of coal was returned by the increased value of coke and tar. Now only about one-fourth of the extra cost of coal comes back in the shape of increased receipts for coke only; consequently the main part of the burden falls on the consumers, shareholders, and employees of the Company.

In 1873, the sliding-scale had not been applied to gas companies. Whatever was necessary was added to the price of gas; and the shareholders received their full dividends all through the coal famine years. They did not share the loss in any way with the consumers.

The adoption of the sliding-scale in 1876 made shareholders and consumers partners. All increase of profits resulting from improvements in, and from cheapening the manufacture of, gas are shared between them—the consumers having the lion's share. At first the proportions were a trifle over three to one; whereas now, by years of careful expenditure of capital on extensions of business, the share of the consumers in any advantage or saving has grown to seven to one—that is, out of every £8 saved they get £7 in the shape of a reduction of price, and the shareholders become entitled to £1 in the shape of an increase of dividend. Of course, when adverse circumstances arise, the process is reversed, and the consumers have to bear their share of losses in the same proportion as they have shared profits. The increase in the price of gas to 2s. 8d. per 1000 cubic feet from Midsummer reduces the dividend payable by nearly £40,000; but the actual reduction to the shareholders will only be about £20,000 a year, because full dividends have not been paid.

In the case of this Company, however, there is a third partner in prosperity and adversity. In 1889, the year of the great strike, the Company introduced a system of profit-sharing, which was, in effect, simply an extension of the sliding-scale to the employees. By this scheme, a certain percentage on salaries and wages is paid annually to the officers and workmen for every penny at which gas is sold below 2s. 8d. per 1000 feet. This percentage, being a proportion of the surplus profits—which enable the Company to reduce the price of gas, and which the employees help to earn—is paid to them, half in the Company's stock, the rest in cash. The last distribution was at the rate of 9 per cent. on salaries and wages, amounting to a total of £24,304, as shown in the accounts. Those surplus profits have now temporarily disappeared, owing to the rise in coal necessitating the increase in the price of gas to 2s. 8d.; and the profit-sharing bonus of the employees also disappears until the price of gas can again be reduced. The Directors have the great satisfaction to report that their employees of all grades, having had the circumstances explained, have accepted the position in the right spirit, as was expected, and are working as cheerfully as ever.

A word must also be said for the consumers of gas. The price was increased from 2s. 1d. to 2s. 4d. at Lady Day, and again to 2s. 8d. at Midsummer. Circulars announcing and explaining the reason for the increase were sent to every consumer. The reception of the unwelcome

CAPITAL ACCOUNT.

	£ s. d.	£ s. d.
Capital account to Dec. 31, 1899	..	3,899,325 14 3
Expenditure during half year to June 30, 1900—viz.		
New buildings and machinery in extension of works	29,795 19 2	
New and additional mains and services	21,150 5 6	
New and additional meters	16,535 3 5	
New and additional stoves	24,630 2 10	
	92,101 10 11	
Cr.—Sale of dry dock (on account)	10,000 0 0	
		82,101 10 11
Total expenditure		3,981,427 5 2
Balance		35,037 1 6
		4,016,464 6 8
Nominal amount added by conversion, less premium		3,145,420 13 4
Total		7,161,885 0 0

Description of Capital.	Certified to Dec. 31, 1899.	Received since that date.	Total.
	£ s. d.	£ s. d.	£ s. d.
Ordinary stock	2,356,885 0 0	..	2,356,885 0 0
Premium thereon	431,086 0 0	..	431,086 0 0
Debenture stock	953,333 6 8	..	953,333 6 8
Premium thereon	275,160 0 0	..	275,160 0 0
Total	4,016,464 6 8	..	4,016,464 6 8
Nominal amount added by conversion—			
Ordinary stock		£3,285,000 0 0	
Debenture stock		566,666 13 4	
		£3,851,666 13 4	
Less premium		706,246 0 0	3,145,420 13 4
Total			7,161,885 0 0

REVENUE ACCOUNT.

To Manufacture of gas—		
Coal into store, including cost of petroleum spirit for enriching and including £26,732 6s. 7d. for labour	£439,363 17 5	
Purification, including £6626 17s. 11d. for labour	17,362 18 4	
Salaries of Engineer and Officers at works	8,010 4 1	
Wages (carbonizing)	62,632 5 7	
Repairs and maintenance of works and plant, including £42,077 6s. 0d. for labour, less £3982 18s. 7d. received for old materials	79,565 9 2	
		£606,931 14 7
Profit sharing for 12 months to June 30, 1900	24,304 14 3	
Less on account	11,000 0 0	
		13,304 14 3
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £13,361 6s. 7d. for labour	23,271 18 9	
Salaries and wages of Officers, including Rental Clerks	11,583 1 8	
Repairing and renewals of meters, including £2046 4s. 11d. for labour	12,076 16 8	
Repairing and renewals of stoves, including £6070 17s. 11d. for labour	10,178 12 1	
		57,110 9 2
Public lamps—Lighting and repairing (including £8831 1s. 1d. for labour)		12,914 17 1
Rents, rates, and taxes—		
Rents payable	£887 11 2	
Rates and Taxes	31,033 8 8	
		31,920 19 10
Management—		
Directors' allowance	£1,790 18 10	
Salaries of Secretary, Accountant, and Clerks	2,504 10 6	
Collectors	9,147 12 6	
Stationery and printing	2,362 16 0	
General charges	5,271 4 1	
Company's Auditors	112 10 0	
		21,189 11 11
Law charges	149 17 9	
Parliamentary charges	4,425 6 4	
		4,575 4 1
Bad debts		1,738 19 11
Pensions and officers' and workmen's superannuation, sick and accident funds		4,797 0 5
Gas Referees and Official Auditor		337 12 1
Leasehold Renewals Fund		800 0 0
Total expenditure		£755,121 3 4
Balance carried to net revenue account		176,617 18 9
		£931,739 2 1

By Sale of gas—		
Lady Day, at 2s. 1d. per 1000 feet	£332,346 12 9	
Midsummer, at 2s. 4d. per 1000 feet	228,203 18 11	
	£560,550 11 8	
Public Lighting and under contracts, including lighting, repairing, materials, &c., £12,914 17s. 1d.	29,336 19 5	
		£589,887 11 1
Meters in use (207,474)—		
Company's Meters at rent: Ordinary, 95,239; automatic, 102,347	£20,550 5 11	
Company's stoves at rent: Ordinary, 48,637; automatic, 81,208; fires, 10,610	16,031 17 8	
		36,582 3 7
Residual products—		
Coke, less £15,348 18s. 4d. for cartage; £1636 11s. 5d. for labour, &c.	217,146 2 4	
Breeze, less £2983 3s. 0d. for cartage; £908 8s. 5d. for labour, &c.	11,030 9 9	
Tar, less £194 4s. 6d. for cartage; £161 5s. 0d. for labour, &c.	26,182 2 0	
Ammoniacal liquor, less £235 14s. 2d. for labour, &c.	9,845 9 9	
Sulphate of ammonia, less £6079 18s. 3d. for acid, &c.; £3555 7s. 2d. for labour, &c.	39,543 13 3	
		303,747 17 1
Rents receivable		1,455 5 4
Transfer fees		66 5 0
Total Receipts		£931,739 2 1

PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits	£5,412 7 8
Interest on debenture stock	22,800 0 0
Balance applicable to dividend on the ordinary stock	153,689 0 2
	£181,901 7 5

Balance from last account		£165,676 7 10
Less dividend for the half year ended Dec. 31, 1899	£150,450 5 4	
Divisible profit carried to reserve fund	10,343 9 0	160,793 14 4
		£4,882 13 6
Amount from revenue account		176,617 18 9
Interest on banker's balances		400 15 2
		£181,901 7 5

news has been such as to prove once more that the British public, when it knows the facts, will act fairly and considerately; for out of the Company's 200,000 consumers, only 28 letters have been received on the subject—the greater part of these objecting to the method of giving the notice rather than to the actual increase of price.

In all other respects the condition and prospects of the Company have never been better. The increase in the consumption of gas over the corresponding half year has been at the high rate of over 12 per cent.; the total increase being 590 million cubic feet. These being the facts, the Directors feel justified in assuring the proprietors that they need have no fear as to the stability of their property, that the cloud will pass, and that when coal returns to a reasonable price—certain to come—their old prosperity will be renewed.

A circumstance that ought not to be omitted from this report is the passing of the Bill which the Company promoted during the present session of Parliament. The Company accepted the recommendations of the Powers of Charge Committee of last session to reduce the initial price and increase the rate of increase of dividend under the sliding-scale. The Directors also took the opportunity of applying for a reduction in the standard illuminating power from 16 to 14 candles, with a corresponding reduction of the initial price, which, after a very careful inquiry, and against very determined opposition by the London County Council, was granted by the Committee. The Bill now only awaits the Royal Assent.

The London County Council also, with no mandate from the consumers, introduced a Bill to alter the method of testing the gas of the Metropolitan Companies, which would have necessitated a large increase of illuminating power, for which the consumers would have had to pay, greatly to their disadvantage. The Council endeavoured to support their case with some very questionable evidence, which the Committee did not accept, and consequently rejected the Bill. The cost of promotion and defence were very heavy, which fall in one case on the ratepayers and in the other on the consumers of gas.

The Directors propose the same rate of dividend per annum as was paid for the previous half year; £5 14s. per cent. was then payable, but only £5 6s. 8d. was paid. The increase in the price of gas from March last limits it on this occasion to £5 8s. per cent.; and that being so, the recommendation is that a dividend of 5¼, or £5 6s. 8d., per cent. be declared. The further increase in price from Midsummer will necessitate a reduction of dividend to the rate of 5 per cent. per annum for the current half year.

Accompanying the report are the accounts. The first two statements relate to the stock and loan capital. The former sets forth that the standard rate of dividend on the £5,641,885 of stock on which it is payable is 4 per cent. at the standard price of 3s. 6d. per 1000 cubic feet; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,520,000. The third statement is the capital account, which, with the revenue and net revenue accounts, we give on p. 297. Following these are statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £129,634; renewal fund, £19,834; insurance fund, £53,727. The statements dealing with the manufacturing operations of the Company furnish the following particulars:—

STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1899.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1900.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal . .	40,046	656,044	572,829	799	122,462
Cannel coal. . . .	1,003	—	16*	—	987
	41,049	656,044	572,845	799	123,449

* 261,964 gallons of petroleum spirit used as a substitute for cannel.

STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1899.	Made during Half Year	Used in the Half Year.	Sold in the Half Year.	In Store June 30, 1900.
Coke—cwts.	445,354	7,056,656	1,692,911	5,606,522	202,577
Breeze—yards	7,663	129,006	24,588	107,135	4,946
Tar—gallons	474,706	5,390,281	357,942	5,177,397	329,648
Ammoniacal liquor—butts . .	38,152	181,357	113,026	79,915	26,568

STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).		
	Thousands.	Thousands.	Thousands.	Thousands.	
Common .	5,618,930	196,152	5,206,729	5,483,048	21,334

The remaining statement is the balance-sheet, which gives the value of the stores in hand as follows: Coal and enriching materials, £114,444; coke and breeze, £6999; tar, sulphate, and liquor, £9038; and sundries, £166,411. The figures this time last year were: Coals, &c., £30,356; coke and breeze, £2709; tar, sulphate, and liquor, £7917; and sundries, £146,792. Among the accounts due to the Company is a balance of £18,338 for gas fittings; and one of £8979 for alteration of street-lamps. A sum of £40,879, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £41,142. Appended to the accounts is the certificate of Sir R. Giffen, the Official Auditor, who points out that a forfeiture amounting to £9, incurred during the half year, must be paid out of the divisible profits, and by way of reduction of dividend.

CRYSTAL PALACE DISTRICT GAS COMPANY.

Half-Yearly Report and Accounts.

The report which the Directors of the above-named Company will present at the half-yearly meeting next Friday opens with an expression of satisfaction that the general business of the Company is in a thoroughly sound and prosperous condition. The increase in the quantity of gas sold over the corresponding half year has been at the rate of 11 per cent.—a rate which has rarely before been reached. These considerations, however, although proving the stability of the Company's business, temporarily sink into insignificance in the face of the enormous rise in the price of coal. Once in the history of the Company has this rise been exceeded—in 1873; but at that time it was to a considerable extent met by a fortuitous rise in the value of tar, and an advance in the price of coke, which approximated to the advance in coal. On the present occasion, however, the price of coke has not gone up in the same proportion; and no new discovery in the use of tar products has come to the aid of gas companies. The Company's coal contracts—all for Newcastle coal—expired last March. They were made a year previously at the then high price of 8s. per ton free on board in the Tyne. This year the North Country contractors wanted 16s. per ton; and the Directors, finding that they could obtain railway-borne coal from the Midlands at a ratherlower cost, have taken their supplies exclusively from that district. To meet the increased cost of coal, after allowing for the extra receipts from coke, an addition of at least 8d. per 1000 cubic feet to the price of gas would be necessary. Under these circumstances, the Directors have raised the charge for gas 4d.—viz., 2d. from March and 2d. from June—to 2s. 10d. per 1000 cubic feet, which will divide the loss nearly equally between the Company and the gas consumers. The Company's share of the burden will be borne partly by a reduction of the dividend payable, partly by a diminution of the profit-sharing bonus of the employees, and the remainder by drawing from the reserves, which fortunately are in a strong position. The Directors believe that the present high price of coal cannot be maintained for any prolonged period. They therefore hold out the hope that the increased charge for gas, the reduced dividend, and the diminished bonus to the employees will only be of temporary duration; and they can give the assurance that at the earliest possible moment the price of gas will be reduced. The dividend recommended for the past half year will be the same as was declared in February last—viz., at the rate of 5¼ per cent. per annum. (Last February ¼ per cent. short of the full dividend under the sliding-scale was paid.) The increase in price will therefore only entail a reduction of ¼ per cent. on the dividend payable in the ensuing half year.

The accounts accompanying the report show that in the six months ending June 30 there was expended a sum of £11,894 for capital purposes; £4653 being for buildings and plant in extension of the works, £2798 for mains and service-pipes, and £4416 for meters and stoves. The total expenditure up to the close of the half year was £732,899, out of £736,226 raised; leaving a balance of £3327. The revenue from the sale of gas was £76,973; the rental of meters and stoves, £3645; residuals produced £29,988; and the total receipts were £110,616, against £97,328 for the six months ending June 30, 1899. On the other side of the revenue account, the items referring to the manufacture of gas are: Coal, £46,649; oil (£4216) and coke (£1944) for oil gas, £6160; purification, £2491; do., oil gas, £445; salaries, £1146; wages (including £433 for oil gas), £6729; maintenance of works and plant, £11,031—total £74,651. Distribution cost, £6611; management, £3516; and the total expenditure in the half year was £89,802, against £77,760. The balance carried to the net revenue account is £20,814, as compared with £19,568. Under the supervision of Mr. S. Y. Shoubridge, the Company's Engineer, 53,877 tons of coal, 12 tons of cannel, 223,282 gallons of gas oil, and 1365 gallons of carburine were dealt with for the manufacture of 548,846,000 cubic feet of coal gas and 88,598,000 cubic feet of 17-candle oil gas—together 637,444,000 cubic feet. Of this quantity, 609,435,000 cubic feet were sold and 616,543,000 cubic feet accounted for. The quantities of residuals produced in the half year were: Coke, 673,612 cwt., of which 215,915 cwt. were used (37,551 cwt. for the manufacture of oil gas); breeze, 15,810 yards, of which 6470 yards were used (531 yards for oil gas); tar, 549,765 gallons; ammoniacal liquor, 11,165 butts; and sulphate of ammonia, 492 tons.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented by the Directors of this Company at the half-yearly general meeting on the 10th prox., they state that the sale of gas continues to steadily increase; the percentage for the six months ending June 30 being 6¼ more than in the corresponding period of last year. The number of automatic meters in use is now 19,317, against 17,104 on June 30, 1899. A further extension of gas-manufacturing plant at Southall is in progress, and is expected to be ready for use next winter. The Directors have had under their careful consideration the probable effect of the enhanced cost of coals and other materials on the business of the Company; but, in view of the increased value of products generally, and a favourable contract for coal, they have decided not to give notice at present of any increase in the price of gas. The amount available for distribution is £78,702; and the Directors recommend the declaration of dividends of 5, 12, and 9 per cent. on the preference consolidated, and new stocks of the Company.

The revenue derived from the sale of gas in the past six months was £126,974, as compared with £119,683 in the corresponding period of 1899; meter and stove rentals were £10,498, against £9413; residuals produced £32,063, against £27,410; and the total revenue was £169,578, against £156,553. The expenditure on the manufacture of gas came to £87,941, as compared with £82,353 (coals and oil costing £65,915 against £57,889); on distribution £17,853, against £16,710; and on management, £5003, against £5066. The total expenditure being £123,618, against £115,966. The balance carried to the profit and loss account is £45,959, against £40,587. Under the supervision of Mr. J. Husband, the Company's Engineer and Manager, 65,928 tons of Newcastle coal, and "Solar" oil equal to 20,960 tons, were used in the past

half year for the manufacture of 938,440,000 cubic feet of gas, of which 859,748,000 cubic feet were sold, and 873,748,000 cubic feet accounted for. The estimated quantities of residuals produced were: coke, 44,230 tons; breeze, 5525 tons; tar, 784,424 gallons; and ammoniacal liquor, 18,919 butts. At the meeting, a resolution will be submitted to authorize the raising of £46,875 of 4 per cent. debenture stock.

THE LONDON COUNTY COUNCIL AND THE TESTING OF GAS.

At the Meeting of the London County Council last Tuesday, the report of the Public Control Committee on the subject of the testing of gas by the portable photometer, some extracts from which were given in the "JOURNAL" last week (p. 230), came up for consideration.

Mr. NATHAN ROBINSON (Chairman of the Committee), having moved the reception of the report,

Mr. E. G. EASTON called the attention of the Council to a chart sent round by the Committee having reference to the great disparity between the quality of the gas as supplied and as it should be sent out. It showed that, as a rule, instead of being of 16 candle power, it had only, on an average, been about 12 or 13 candle power. He should like to ask whether the Committee were going to take any steps to prevent this practice, or obtain for the consumers a proportionate relief. What he meant was that if they were robbed of 25 per cent. of the illuminating power of their gas, it was only right to expect that they might have a 25 per cent. deduction from the bill.

Mr. NATHAN ROBINSON said he fully appreciated the remarks of Mr. Easton, and he should like to ask every member of the Council to carefully read the report of the Committee. Then it would be seen that, so far as the Committee were concerned, they attempted to promote a Bill to make the portable photometer a legal testing apparatus; but the Committee of the House of Commons—probably never known to be altogether antagonistic to monopoly—had, in this particular instance, shown their devotion to monopoly to its fullest extent. The Public Control Committee simply asked Parliament to put them in possession of a power which would compel the Gas Companies of London to supply the article they professed to sell. The Counsel knew that if a licensed house supplied them with an article which was below the legal standard, the unfortunate publican was taken before a Magistrate and fined. If a milkman put a drop of water into his milk, he likewise was cited to appear before a Magistrate. But the Gas Companies seemed to have absolute power to do just what they pleased. He was quite certain that if the members of the Council would carefully read the report of the Committee they would see that they had attempted to secure the public against the malpractices on the part of the Gas Companies to which reference had been made, and also that Parliament—or rather a Committee of the House of Commons—had prevented them from doing their duty to the public.

Mr. J. ALLEN BAKER asked if some practical step could not be taken by the Committee to secure that at all events the consumers obtained the right quality of gas if they had to pay a higher price for it. He happened to be one of the victims of the recent increased charge, the effect of which he felt rather severely, for he paid for his gas just over £600 a year at the old price, and the rise meant the addition of another £100 per annum. If they had no option but to pay this increased price, it seemed to him that, at all events, they should get good quality and proper pressure of gas. It bore very hardly upon those who used gas not only for lighting, but for driving engines, and so on, and it also pressed very heavily upon the Council, because they were very large users of gas in connection with the gas-engines employed at their pumping-stations and other places; and unless they got good quality and full pressure, they paid a very high price for an article which was not supplied according to contract. He recently had an interview, upon what he felt to be a great grievance in connection with his own firm, with the Secretary and General Manager of the Gaslight and Coke Company; but no satisfaction whatever could be obtained from him. Instead of making a reduction in price where large quantities of gas were used for mechanical power, they increased it. He hoped, at all events, something could be done to secure their having gas of proper quality, if they had to pay the full price for it.

Mr. W. PEARCE asked the Chairman of the Committee if their attention had been directed to the modern practice of gas companies in mixing water gas with ordinary coal gas. Water gas had no illuminating power, and this had to be imparted to it by extraneous methods in the shape of hydrocarbons. After these had been put in, there was danger of their depositing in the pipes, and of the luminosity of the gas being reduced. Mr. Livesey had been asking for a reduction of his standard from 16 to 14 candle power. Water gas could be produced at a very much lower cost than coal gas; and it was quite evident that if any gas company were able to mix 10 or 15 per cent. of water gas with their coal gas, although they might have to artificially make it luminous, they would make a very fine bargain with the public. He thought this subject was well worth the attention of the Committee. The practice to which he had referred was objectionable in another way. Water gas contained carbonic oxide, which was exceedingly poisonous—much more poisonous than coal gas; and there were objections to its use on the score of public health. He was sure it was a growing practice on the part of gas companies to increase the percentage of water gas in their coal gas, and if they were not carefully watched, they would be able to make a magnificent bargain with the public with a reduction of their illuminating power. He thought the attention of the Committee might be directed to the points he had indicated—first, whether the cost of coal gas was not largely reduced by the admixture of water gas; and, secondly, whether it was not deleterious to the public health when mixed above a certain percentage in gas supplied to a house.

Mr. H CLARKE said there was another point which affected the profits of the Gas Companies and the interests of the ratepayers. In the contracts for the street-lamps, it was stipulated that the flame should be of certain dimensions. Any inhabitant of London who walked about the streets after dark and took notice of the dimensions of the flame of the gas-lamps would frequently discover that it was a little more than half the proper size; so that apparently the Gas Companies had to be brought to book in many ways. He trusted, as a consumer and a ratepayer, that they would be.

Mr. NATHAN ROBINSON, in answer to Mr. Pearce, said the Committee had had the subject of water gas under consideration on more than one occasion, and the Chemist had made tests for the presence of this gas, and had never found—up to the present time, at any rate—that there had been more than was allowed.

The Committee's recommendation was agreed to.

LONDON LOCAL AUTHORITIES AND THE GAS QUESTION.

At the Meeting of the Court of Common Council of the City of London last Thursday, some time was devoted to disposing of a number of resolutions and communications which had been placed upon the paper of business, dealing principally with the high charge made for gas by the Gaslight and Coke Company, as compared with the relatively low one of the South Metropolitan Company.

The first matter was a report from the Streets Committee, submitting one by the Remembrancer on the Bill of the last-named Company. It set forth that the Select Committee of the House of Lords, before whom the Bill came on the 11th inst., unanimously rejected the preamble of the part of the Bill relating to the proposed purchase by the Company of the portion of the district of the Gaslight and Coke Company south of the Thames. This report was, on the motion of Mr. A. C. Morton, ordered to be printed and circulated for the information of the members. Following this came a resolution from the Vestry of the parish of St. James and St. John, Clerkenwell, in the following terms: "That the Corporation of the City of London be asked to convene a conference of the Vestries and District Boards north of the Thames (similar to that convened on the telephone question), to consider what steps can be taken to protect the consumers against the continued excessive and exorbitant charges of the Gaslight and Coke Company." The next item was a communication from the London County Council relative to a proposed conference, after the recess, of representatives of the Corporation of London and the Vestries and District Boards of the Metropolis, with regard to the charges made for gas by the London Gas Companies, the quality of the gas, the quantity supplied through slot meters, and the action which should be taken in the interests of the consumers; and asking the Corporation to appoint representatives to attend the conference. The letter further stated that particulars as to the date of the conference would be sent. Finally, there was the following motion by Mr. A. C. Morton: "That a conference of Local Authorities in London be held at the Guildhall, on a date to be fixed by the Right Honourable the Lord Mayor, to consider the increasing charges of the Gas Companies for the supply of gas to the Metropolis; that each authority be invited to send three delegates to such conference; and that it be referred to the Streets Committee to make the necessary arrangements accordingly."

To suit the convenience of the Court, Mr. Morton's motion was taken first of all.

Mr. MORTON, who was complimented by the Chairman of the Streets Committee for the untiring and successful part he had taken in the Committee-rooms of both Houses of Parliament this session, stated that, without in any way being antagonistic to the County Council, he wished his motion to be adopted, as it would not prevent the Corporation sending delegates to the County Council's conference. He would like to see a conference called in the City separate from, and in addition to, that of the County Council. Without being at all offensive to the Council, he believed the Corporation would be more successful in the Committee-rooms of the House of Commons if they were to go united with the Local Authorities than with the Council, who had in hand several matters relating to slot meters and fittings and the quality of gas which had been settled by Parliament this session. What he wished was to keep the one question of price before the Local Authorities, 26 of whom had appeared in the Committee-rooms this year and had succeeded in saving the Municipal Authorities north of the Thames between £30,000 and £50,000 per annum on public lighting alone.

Mr. A. A. WOOD seconded the proposition, stating that the question of the inequalities in the price charged for gas was in all men's minds. He said the question was very much in their minds now. They knew exactly what they wanted, and they would make a stern effort to get it—that was to put an end to the difference of 3s. 5d. against 2s. 8d. per 1000 cubic feet for gas on the north and south sides of the Thames.

The motion was carried and was referred to the Streets Committee, as were also the resolution of the Vestry of St. James and St. John, Clerkenwell, and the communication from the County Council—in the last case for the appointment of delegates.

Local Authorities and Sources of Water Supply.—At the monthly meeting of the Executive Council of the County Councils Association, held last Wednesday at the Guildhall, Westminster, under the presidency of Sir J. T. Hibbert, the Committee appointed to consider the question of the sources of water supply which were or might become necessary for local consumption, presented their report. They stated that, though the replies which they had received to a circular issued to local authorities on the subject were not numerous, they were sufficient to show that in most counties in Eng'and and Wales there are districts where the supply of water required to meet the wants of the locality is, or is likely to be, imperilled in the immediate future. This is attributed, in the majority of cases, to the action either of water companies or of colliery proprietors. The Committee entered into communication with the Association of Municipal Corporations, and at a meeting held on the 14th of February last, the opinion was generally expressed that the best course would be to introduce a Bill into Parliament dealing with the question, with the object of having it referred to a Royal Commission or a Select Committee of the House of Commons. No formal resolution was proposed; but the Committee of the County Councils Association undertook to draw up a statement, embodying their proposals in outline, in the hope that such proposals might form the basis of a Bill which would command the approval of both Associations. The Executive Council resolved to have a Bill drawn embodying the proposals of the Committee.

NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held at Winchester House, Old Broad Street, E.C., on Thursday last, to consider the provisional agreement entered into with the Welsbach Incandescent Gas-Light Company, Limited, for the sale to that Company of the business of the Sunlight Company, and to determine what course should be adopted for dealing with the remaining assets and liabilities of the Company. Mr. J. H. DUNCAN, Chairman of the Company, presided.

The SECRETARY (Mr. Laurence Fletcher) having read the notice convening the meeting,

The CHAIRMAN said he wished to make a few introductory remarks before the contract which they had come together to consider was read. First of all, he would take them back to last year, when they met for their statutory meeting. They had just gained a great victory in the Court of Appeal over the Welsbach Company in the matter of the De Mare patent. Following upon this, they got the De Mare patent amended; and then they commenced an action against the Welsbach Company for infringing the patent by the manufacture of the Kern burner. This led to their also beginning another action for the revocation of the Kern patent. This provoked retaliation from the other side, who asked for the revocation of the De Mare patent. At that time, the Sunlight Company had several actions pending against them; and they could do nothing but go on with the litigation. From the commercial point of view, they opened the season, he was glad to say, extremely well; but they were pulled up rather by the want of supplies. They had taken over a factory in Germany for the manufacture of their new white mantle. This factory, however, got to work very slowly, and disappointed the Directors in the quantity of mantles it could turn out. They succeeded in making an excellent arrangement with a large factory in Switzerland; but unfortunately, owing to some difference in the process, the first mantles received from there did not give satisfaction. It was not until March that they got really good mantles; so that during the whole of the winter they had had to rely solely upon their own little factory. This kept down the sales enormously. They cou'd have got rid of four times as many as they were selling. Apart from this discouraging side, the popularity of the mantle and the success achieved with it were very satisfactory. This brought them up to March, when the 1886 patent action came to a head. This action was heard under rather peculiar circumstances. It was tried by a Judge who had only just been appointed. He referred to Mr. Justice Buckley. The Sunlight Company had to go into Court with two of their principal witnesses (Sir William Crookes and Professor Lewes) in a feeble state of health; so that they were not in a very favourable position. The consequence was that their Counsel, thinking he had by cross-examination got sufficient facts from the witnesses for the other side, elected not to put his witnesses in the box at all, with the result that the judgment went against the Sunlight Company. The Directors considered then, and considered still, that on appeal this judgment would have been reversed. This brought them up to the point which affected them that day. The 1893 action then came on. This action was, of course, the *crux* of the whole situation, because if the Welsbach Company were successful in that, they could put a stop to the Sunlight Company's trade. Therefore the Board and their advisers had devoted their energies day and night to this matter. Altogether, this action had caused them a very great deal of anxiety and work to prepare. Having, as they believed, got it into a very good condition, their care was to bring it on at the right time. The Kern patent revocation action had also reached the stage at which it could be heard. He mentioned these two matters in order to lead up to the next step. A few weeks ago, the Welsbach Company called their shareholders together, having just prior to that reduced the prices of their commodities to the extent of 40 per cent. At this meeting there was a good deal of bickering; and in the course of the proceedings, the Managing-Director of the Welsbach Company rather threw out the suggestion that if the Sunlight Company would make proposals to his Company, they would be very favourably considered. Of course, it was impossible for them not to take up such a challenge; but to their astonishment nothing came of their efforts. As therefore there did not appear to be any very great hope in that quarter, the Directors went to work to bring to a head the litigation which had been pending. They decided to put forward the Kern patent revocation case first. In this the Sunlight Company had very little to lose; while the other side could not well afford to experience defeat. This action was to be immediately followed by that dealing with the 1893 patent. The Welsbach Company had evidently been led to believe that they had a very strong case in regard to the Kern patent; and they went into Court in the most confident spirit. They fought the case in Court for eight or nine days. Judgment in it had not yet been given—and very probably never would be given; but the opinion of those present (he thought he might say even of the people on the other side) was that the Sunlight Company had won the case hands down—that they had completely proved their contention. Having scored this success, the Directors were very anxious, if possible, to open up negotiations again; but how to do it they did not know. It was at this moment that a mutual friend (Mr. Tilden Smith) came to the assistance of both Companies. The result was the agreement now before the shareholders; and with that in their hands, they went to the Court and told the Judge what had taken place. He consented to defer his judgment for a time, in order that the shareholders might be consulted. If the amalgamation was carried through, the litigation with their rivals would be at an end; and all the actions (he believed there were eleven) would be dismissed. The commercial history of the Company for the past year was satisfactory on one side, and unsatisfactory on the other. They would remember how he had insisted last year on the question of turnover; and not having been able to manufacture as much as they could have sold, they had not been able to top their expenses. They had had a very fair gross profit, but not a net profit. Taking into account the legal expenses, there would be a loss of several thousand pounds when the accounts came to be made up. He would next ask the Solicitor to read the agreement which had been entered into subject to the approval of the shareholders.

The SOLICITOR to the Company (Mr. Arthur E. Abrahams) then read the agreement.

The CHAIRMAN (continuing) said the contract was fairly clear. It meant that the Company were to retain in their own hands all book debts, cash, and certain other assets, in order to meet their liabilities. They were to receive for the goodwill of the business, patents, stock, &c., £110,000 of 5½ per cent. stock. This was a debenture stock, in the sense that it was a liability payable by the Welsbach Company, but was not charged by any special mortgage. The conditions attaching to this stock would make it a really first-class security; and the only thing he knew of against it was that the Welsbach Company retained power to redeem it. One point he must touch upon was the commission they had had to pay on account of the negotiations. He could easily understand shareholders thinking that £5000 was a good deal to pay on this head. But it must not be forgotten that the two Companies were not friendly; they were rivals, and there was an immense amount of jealousy between them. Many efforts made by the Directors on both sides had come to nothing. The fact that the Welsbach Company were paying Mr. Tilden Smith exactly the same sum as they were proposing to do, showed that the difficulties of the matter were realized in that quarter also. When first announcing the scheme, the Directors had said that the amount payable under the agreement worked out to about 10s. per share. They said "about" in order to give themselves a little time to look into all the liabilities. Having now done so, they did not think the estimate of 10s. was at all a sanguine one—in fact, they believed the amount divisible would more nearly approach 11s. per share. This would mean that 55 per cent. of their capital would be returned to them in a first-class debenture stock. They would take their 5½ per cent. whether the Welsbach Company made a profit or not. He had been a great critic of the Welsbach Company; and he thought they had gone a little too fast in reducing their prices. But allowing for all this, the property must be a very fine one. They would, after this amalgamation, have nothing to fear from other rivals, but would easily beat anyone who came into the field. Some of the shareholders complained of the reorganization last year, when 5s. a share was called up; but since then, it must be remembered, the business had been shorn of 75 per cent. of its profits. A year ago, the incandescent business was a name to conjure with in the raising of money; but now he feared it was quite the opposite. Not being able, therefore, to raise further money, their business must, if the amalgamation fell through, come to a standstill. Dealing with the past year's trading, he said that, had it not been for the supplies falling off, they would have done a very good business; but even if they had had such a result, it would have been affected by the sweeping reduction in prices that had been carried out independently of themselves. Last year it was a splendid business; now they were coming down very near to the bone. If they were going to continue their trading, they must have a large amount of new capital. Having pointed out the evil that would result to the incandescent trade generally if the Welsbach 1893 patent was destroyed, he concluded by moving—"That the provisional agreement submitted to the meeting, and dated the 17th day of July, 1900, which has been entered into with the Welsbach Incandescent Gas-Light Company, Limited, for the sale to that Company of the business, goodwill, and property of this Company (other than cash, bills, book debts, and certain other excepted assets), and for the settlement of all litigation between the two Companies, be and the same is hereby approved, ratified, and confirmed; and that the Directors be, and they are hereby, authorized and requested to carry the same into effect."

Mr. PARKER seconded the motion; and it was carried unanimously.

The CHAIRMAN said there were three alternatives in regard to the method of disposing of the money. One of the conditions was that the Sunlight Company should be got out of the way as quickly as possible; and it was therefore absolutely necessary that the shareholders should at once give directions as to which of the three plans was to be adopted. The proposals were: (1) The voluntary winding up of the Company and the transfer of its remaining assets and liabilities to a new Company to be formed by way of reconstruction of this Company, but with objects restricted to the dealing with, and disposition of, the remaining assets. (2) The voluntary winding up of the Company with a view to the distribution of the assets among the shareholders in specie, and the formation of a small new Company. (3) The continuance of the Company, subject to such alteration of its Memorandum of Association as might be required. The plan recommended by the Directors was the second of the three; and he begged therefore to propose "the voluntary winding up of the Company with a view to the distribution of its surplus assets amongst the members in specie (provided that the Welsbach Company elect to pay their purchase-money in the form of debenture stock, so as to enable such a distribution to be made), thus involving no reconstruction, but only the formation of a new Company with a small nominal capital for the purpose of giving effect to the agreement with the Welsbach Company."

Mr. FREDERICK WALKER seconded the motion.

An amendment to the effect that the meeting be adjourned for three weeks having been put to the meeting and lost, the resolution was carried unanimously.

Mr. OLIVER WETHERED next moved—"That a sum of not exceeding £5000 be paid to the Directors out of the assets of the Company for their extra services, and as compensation for their proposed loss of office or the reduction of their numbers and remuneration (as the case may be), such sum to be divided amongst them in proportions similar to the division of their present remuneration, or in such proportions and manner as the Directors may determine amongst themselves." In doing so, he said it was to be distinctly understood that if anything less than 11s. per share was available for division among the shareholders, the difference was to be made good out of the £5000.

Mr. LOWE seconded the resolution.

Mr. HOLMES proposed, as an amendment, that the motion be suspended until the holding of the next meeting.

Mr. LOVIBOND seconded the amendment, which, on a show of hands, was declared carried.

The proceedings then terminated.

Water Supply for Littleport.—The Ely Rural District Council have engaged Mr. E. J. Silcock, of Leeds, to prepare a scheme for an improved water supply for Littleport. The town is situated in the Fens, and is at a considerable distance from any available source of suitable water.

THE SULPHATE OF AMMONIA COMMITTEE.

Third Annual Report.

The following report, dealing with the work of the Executive Committee of the above-named Committee in the year ending June 30 last has been issued by the Chairman (Mr. W. G. Blagden), and will be submitted at the annual general meeting of subscribers to-day:—

There has been a very marked increase in the number of competitions carried out by agricultural societies during the past season, compared with the figures for the preceding year; the numbers for the two periods being 69 and 47 respectively. Of the 69 competitions brought to a successful issue this season, 34 were organized by English societies, 34 by Scottish societies, and one by an Irish society. In addition to these, 14 societies—6 Scottish, 5 English, and 3 Irish—who had accepted the Committee's offer of prizes, abandoned their competitions, chiefly on account of the unfavourable character of the season for root crops.

The tabulated results of the 1898 competitions, accompanied by a report drawn up by the Committee's Agricultural Adviser (Mr. John Hunter, of Edinburgh), were issued towards the end of last year. Twenty thousand copies of this report were printed, of which number only 8000 were taken by subscribers. Copies of the report were sent to the principal Agricultural Societies throughout the kingdom, and those societies who had carried out the competitions were invited to apply for as many copies as they might require for distribution among their members. The demand, however, from this source was not large, as rather less than 2000 copies were applied for.

Mr. Muir's essay which gained the 500 guinea prize was published early in September, and 20,000 copies were printed, of which number 5000 were bound in cloth. In all, about 15,000 copies of the work have been distributed. The essay entitled "Sulphate of Ammonia: Its Characteristics and Practical Value as a Manure," which the Committee purchased from Professor Warington, M.A., F.R.S., was published in February. Twenty thousand copies of this work were printed, 2500 being bound in cloth; and about 12,000 in all have been distributed. Upwards of 5500 copies of an illustrated pamphlet entitled "Manuring with Brains," which was published by the Potash Syndicate, have been distributed among the subscribers. During the past year, articles on "Sulphate of Ammonia" have appeared from time to time in the following papers: "Glasgow Herald," "Times," "Field," "Farmer and Stockbreeder," "Farming and Market Gardener," "Nineteenth Century," and "Edinburgh Evening Despatch." These articles amounted in the aggregate to 2400 lines. A similar arrangement has been entered into for the present year; the expenditure being limited to £50.

At the beginning of January, the Committee commenced to advertise in 13 agricultural periodicals and 256 provincial newspapers. The advertisements continued to appear until the middle of May; the total cost of this advertising was £777 14s.; and, as in the previous year, the provincial papers were selected by the subcribers from lists submitted to them by the Committee.

On the expiration of Mr. Hunter's second year of office as Agricultural Adviser to the Committee, he was re-appointed for a further period of twelve months at a salary of £200.

In recognition of the numerous additional services which he has rendered the Committee, Mr. Chris. Middleton, the author of the pamphlet, "A Few Facts about Sulphate of Ammonia," has been paid an additional sum of 20 guineas.

Mr. William Love, of the Broxburn Oil Company, Limited, and Mr. Charles Carpenter, of the South Metropolitan Gas Company, have been elected members of the Executive Committee in the places of the late Mr. W. Kennedy and Mr. Frank Livesey; and Mr. R. O. Paterson, of the Cheltenham Gaslight and Coke Company, Mr. Alex. M. Chance, of Messrs. Chance and Hunt, Limited, of Oldbury, and Mr. Francis T. Cotton, of the Alliance and Dublin Consumers' Gas Company, have been elected members of the Executive Committee.

The Executive Committee regret that the total tonnage represented by the subscriptions received during the past twelve months shows a falling off, compared with the figures for the previous year, of 3267 tons, or about 3 per cent. The tonnage represented by the different districts for the two periods is as follows:—

—	July, 1898, to June, 1899.	July, 1899, to June, 1900.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Scotland	45,181½	45,810	628½	..
London and Home Counties	31,303½	30,350	..	953½
Lancs. and Yorkshire	18,190½	16,978	..	1,212½
Midland Counties	10,798	9,321½	..	1,476½
Northern Counties	4,628	5,055½	427½	..
West of England	2,493	1,650½	..	842½
Ireland	1,369	1,428	59	..
Wales	131	234	103	..
	114,094½	110,827½	1,218	4,485
				1,218
			Decrease	3,267

The Executive Committee consider that the very large increase in the number of agricultural competitions carried out during the past season and the extremely good results which were obtained is a most satisfactory feature in the year's work, as it is the best possible indication of the growing interest which farmers and others are now taking in the intelligent use of artificial manures. The present season, however, promises to show a further substantial increase in the number of agricultural competitions, as 69 societies have already entered and agreed to arrange 84 competitions. It is interesting to note that four of these societies are Irish; and it is hoped that, with the assistance of Mr. Hunter, other societies in that country may be induced to follow their example, and organize competitions. The Committee are of opinion that no effort should be spared to extend the area over which these agricultural competitions are carried out, for by means of them the great advantages of the use of sulphate of ammonia are brought home to the actual consumer in the most impressive manner.

Report of the Agricultural Adviser.

Accompanying the preceding report is that of the Committee's Agricultural Adviser on the competitive experiments carried out in the season 1899. It is dated the 25th ult., and is accompanied by tabulated particulars of the experiments. Mr. Hunter's report is as follows:—

While the reports of the experiments for the season 1899 show some improvement in the systems of manuring, there is still room for more on the part of many agriculturists, as is evidenced by the mixtures and methods of application recorded in the following notes. For example, it is not good agriculture to mix slag, superphosphate, kainit, and sulphate of ammonia, and to sow this mixture either broadcast or in the drills. Slag contains free lime; and when such a mixture as is here indicated gets on to or into a damp soil, changes are almost certain to take place that will prove detrimental to the sulphate of ammonia, and also probably to the superphosphate, and consequently, of course, to the crops. Neither is it good agriculture to sow sulphate of ammonia in "the back end," nor is it advisable to top-dress with sulphate of ammonia so late as the end of July. In the former case, much loss must be suffered because of the nitrification of the sulphate of ammonia before the crop is there to use the products; and in the latter it is more than probable that much of the derivable benefit will be lost because the alterations in sulphate of ammonia in the soil which are essential to its being serviceable to plants will not be completed in time for the season's growth.

Again, it has been abundantly proved on Lord Rosebery's experimental station at Dalmeny that the annual application of from 3 to 5 cwt. per acre of ground lime, or of lime shells slaked, and more especially if the lime contains notable proportions of magnesia, is of the greatest importance, if the best results are to be obtained from the manures employed, and especially where dung or sulphate of ammonia is used. It is, however, of the first importance to note that the lime, just as in the case of slag, should be sown weeks before the other manures are applied, if the costly artificials are not to be sacrificed, and the best crops are to be raised. This line of action is especially important where sulphate of ammonia is used; and as it is undoubtedly the line to follow where quantity and quality of crops are desired, and where good feeding and good keeping qualities are important, agriculturists ought certainly to give it more attention than they have in the past. This rational use of lime is discussed in the Committee's pamphlet on "The Science of Manuring," and it would be well for proprietors and agriculturists if they would carefully ponder over the facts there narrated.

In these 1899 reports, there are but few references made to results obtained from the use of nitrate of soda as compared with sulphate of ammonia, but where there are any, they again point unmistakably to the increased appreciation of sulphate of ammonia; and there can be no doubt whatever that the more intelligent interest an agriculturist takes in his profession, the less of the alkaline nitrates—nitrate of soda and nitrate of potash—will he use.

Experiments are being carried out this season (1900) in various parts of England and Scotland, where sulphate of ammonia and nitrate of soda are being carefully tested against each other on the oat crop. It is too early to form any opinion of the ultimate results; but if there be anything like confirmation of those obtained at Dalmeny, Woburn, and elsewhere, the bulk, and more especially the weight and the quality of the grain, should in every case be better where sulphate of ammonia is employed.

Your experiments have not included sugar-beet culture, which is perhaps a regrettable omission; but it is a fact that comes within your reporter's knowledge that since the publication of the results of the sugar-beet experiments on Dalmeny in 1897, the demand for sulphate of ammonia in the beet and sugar-cane growing countries has increased enormously, and is certain to become conspicuously greater than in the immediate future. All the results recently obtained show that when sulphate of ammonia is rationally used in sugar-cane and beet culture, there is a very distinct advantage over nitrate of soda, both as regards the total sugar and, what is more important still, the percentage of crystallizable sugar.

Let it be understood that the rational use of sulphate of ammonia implies the conjoint use of all the essential inorganic constituents, of which lime and magnesia as carbonates are as important as, if not more so than, phosphates or potash or anything else; and that inattention to this all-important fact has been the cause in the past of probably every one of the few disappointments that have been experienced in the using of sulphate of ammonia. With this neglect remedied, there is no other purely nitrogenous manure that will not compare unfavourably with sulphate of ammonia.

Class I. (*Yellow Turnips*).—The reports in this class are more than favourable, for, notwithstanding the fact that 1899 was pretty universally a disastrous year for turnips, we have here a record of many very large crops; numerous cases that are more than the average of a good season; while the few that may be regarded as low are in reality among the very best in their districts.

Class II. (*Swedes*).—The remarks on Class I. are equally applicable in this. There is, however, a new interest here, in so far as we have Ireland taking a part for the first time in these highly-instructive experiments. The manner in which the Coachford Agricultural Society (County Cork) have gone about their work is greatly to be commended, and their results deserve more than passing notice, as the following data as to the crop per acre will show:—

	No. 1. Tons Cwt.	No. 2. Tons Cwt.	No. 3. Tons Cwt.	No. 4. Tons Cwt.
Full manuring—				
With sulphate of ammonia	32 10	28 0	26 0	25 5
Without „ „	26 0	21 0	16 0	18 0
Excess produced by sulphate	6 10	7 0	10 0	7 5
Sulphate used per acre	1¼ cwt.	1 cwt.	1 cwt.	1 cwt.
Costing at (say) 12s. per cwt.	15s.	12s.	12s.	12s.
Which yielded, taking swedes at 25s. per ton	£8/2/6	£8/15/0	£12/10	£9/1/3

This just means that, with a break of (say) 40 acres of swedes, these

farmers would have an extra profit of £295, £326, £476, and £338 10s. respectively, in addition to the ordinary profits from their crops; and if this extra yield is converted into beef or mutton, the benefit would, as a matter of course, be increased correspondingly. These figures are simply confirmatory of the declarations of the authors of "The New Soil Science," and they go a long way to show to agriculturists of a sea-girt country like Ireland what improvements can be made, and at what a small cost, where material suited to their country and climate is used.

Class III. (*Mangels*).—Generally it is only the prize-winning crops that are detailed, but in most cases numerous other results are reported to your Committee from each district, and are excluded from the tables simply for want of space. In practically every instance the others in order of merit follow closely on the heels of those tabulated, and there is but one exception to those features which were emphasized in the report for 1898—viz., sound roots, good quality, and excellent keeping properties. The Escrick and District Agricultural Club again distinguish themselves by so elaborating their experiments that the results are extremely advantageous to themselves, valuable to your Committee, and educative to mangel growers everywhere. The experimenters have in each case provided a plot without sulphate of ammonia, but in other respects identical with the competing areas, and the crops per acre are as follows:—

	No. 1. Tons	Cwt.	Qrs.	Lbs.	No. 2. Tons	Cwt.	Qrs.	Lbs.	No. 4. Tons	Cwt.	Qrs.	Lbs.
With sulphate	57	7	0	0	48	7	3	12	34	11	1	20
Without sulphate	41	2	2	12	38	15	3	4	30	6	2	12
Increased produce	16	4	1	16	9	12	0	8	4	4	3	8
Cost at (say) £12 per ton		18/-				12/-				12/-		

No. 3 is excluded from the above because sulphate of ammonia was used on both breaks, but in different proportion; the larger quantity used proving a highly profitable investment. In two of the three cases detailed, the expenditure of 12s. per acre has yielded an extra 4 tons 4 cwt. and 9 tons 12 cwt. respectively; while 18s. worth of sulphate of ammonia has given an increase of 16 tons 4 cwt., which shows an extra profit over the ordinary manuring that mangel growers and feeders had better calculate out for themselves.

The North Walsham and Aylsham Agricultural Association also have taken the trouble to duplicate their experiments this season, which is very gratifying, if for no other reason, because it is an excellent indication of the increased interest farmers themselves are taking in this highly-educative work. The North Walsham figures are as follows:—

	No. 1. Tons	Cwt.	No. 2. Tons	Cwt.	No. 3. Tons	Cwt.
With sulphate	34	8	33	9	33	5
Without sulphate	30	4	27	7	26	7
Excess produced	4	4	6	2	6	18
Costing at (say) 12/- per cwt.		12/-		12/-		12/-

The "no sulphate" plots were manured and treated in the same manner in every other respect as the sulphate breaks; and the result in favour of sulphate of ammonia will be a surprise to those who will take the trouble to calculate the extra produce—from the application of 1 cwt. per acre—into mangels, beef, or mutton, and thence into pounds, shillings, and pence!

Class IV. (*Early Potatoes*) has again no entries. This is very unfortunate for the growers, because while it is quite well known that many of the large purchasers of early potatoes, grown on the West of Scotland, absolutely decline to buy those grown by the aid of nitrate of soda, there are no objections whatever to those to which sulphate of ammonia has been given, for these cannot be of that waxy character which always results from the use of alkaline nitrates. It is a fact that early potatoes grown at the Azores which surprised the London market this spring (the seed for which did not leave Scotland until the first week of November, 1899, while the crop was returned to, and sold in, London in the first week of March, 1900), were grown mainly by the aid of sulphate of ammonia. The crop was about double what has ever been known to be raised previously at the Azores; the quality was excellent; and they realized £15 per ton. This is a new source of supply against which home growers of early potatoes will have to compete, and unless those home growers accept the teachings of the new and true science, as has been done abroad, or make experiments for themselves on such lines as your Committee have suggested and have backed by competent advice, they will surely lose their place in the race.

Class V. (*Late Potatoes*).—This is again an interesting class, and when we consider that the average crop of the country in 1899 was not over, but probably considerably under, 6 tons per acre, the results in these trials of from 10 to 16 tons per acre must come as a surprise to many. No doubt there is one case of 8 tons 4 cwt. per acre; but as that is the only one under 10 tons, it is almost justifiable to exclude it in striking an average. It is simply a matter of fact that the potato crop of 1899 went so badly with disease that in very many cases not less than half proved useless and unmarketable. But yet, in the face of this fact, there is only one instance in the whole of those experiments where the potatoes grown by sulphate of ammonia did not keep well; and in this case the tubers of the whole district went bad, no matter what manures had been used. The remarks of the judges and of the growers themselves under the heading "Keeping Properties" in preceding tables must form interesting and instructive reading to those who can appreciate the opinions of some of the best men in the country. They also completely corroborate the results obtained at the leading experimental stations of Britain, where it has been proved up to the hilt that, when rationally used, there is no purely nitrogenous manure known that gives weight and quality of crop and keeping qualities comparable for one moment with sulphate of ammonia. It must be very gratifying to your Committee to find in the 1899 results so much that is in harmony with those of 1898. In truth, there is no contradiction, for every statement made this season is a substantiation of all you have ever claimed for sulphate of ammonia, and of everything that has been said in its favour by those who were competent to judge.

The prizes given by your Committee for yellow turnips and swedes exhibited at the show of the Scottish National Fat Stock Club were gained by Lord Rosebery and Mr. Hogg. The quality in each case was "excellent;" and the keeping qualities have proved "exceptionally good." There were several other special competitions in the turnip classes; and it is worthy of being carefully noted by agriculturists that in every case, as far as ascertained, all the crops that gained the leading prizes were grown by sulphate of ammonia. In the cabbage competition at the same show, four out of the five prizes were won by exhibits grown with the aid of sulphate. This result is simply a repetition of those of 1898; and it is a strikingly strong confirmation of the anticipations in your previous reports, and of the unvarying results obtained at the Dalmeny experimental station, where quantity, quality, and unsurpassable keeping and feeding qualities have been invariably associated with the application of sulphate of ammonia.

In your Committee's report of the 1898 experiments, emphasis was laid on the necessity for the universal use of small quantities of the essential ash constituents—lime and magnesia—in addition to dung, phosphates, potash salts, and sulphate of ammonia. Ground lime shells—sold as ground lime—or in its place slaked lime, should be used annually to the extent of from 3 to 5 cwt. per acre, and should be broadcast four to six weeks before other manures are applied. This lime application materially increases the benefit derivable from all the higher class manures, such as bone manures, supers, potash salts, dung, and sulphate of ammonia. This fact is being realized by sugar-cane growers, who have returned to the use of sulphate of ammonia and discarded nitrate of soda; while at home the benefits have been so conspicuous that producers of ground lime are at present quite unable to meet the requirements, even with increased and improved grinding plant.

This report would surely be incomplete if reference were not made to the competitions for prizes offered by your Committee for barley grown by the aid of sulphate of ammonia and exhibited at the Brewers' Exhibition in the Royal Agricultural Hall, London, in October, 1899. It is worthy of note that the crops which gained your Committee's prizes gained also commendation in the British malting barley competition. They gained also the first, as also a special prize in Class X. "Extra Special London Brewing Prizes." In Class XI., the "Special Shropshire Prizes," they again won the first and a special prize. Again, in Class XIX.—"Mark Lane Express" Diplomas for Seed—the three competitors for the Sulphate of Ammonia Committee's prizes gained four diplomas with the barley grown with sulphate of ammonia. This is "record-breaking" and no mistake; but, after all, it is only what might have been anticipated when we think of the results obtained at Dalmeny, Rothamsted, Woburn, and other experimental stations where, weighed on the scales and their malting qualities judged of by practical experts, the barleys grown by sulphate of ammonia have been declared superior in every respect to those grown by nitrate of soda. Brewers themselves are now beginning to realize, that, for malting for beer production, nitrated grains are objectionable for several reasons that need not be discussed here; but there is little doubt that this top-dressing of barley by a soda salt—*i.e.*, nitrate of soda—has had much to do with brewers looking abroad for grain that would better suit their purpose.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., last Wednesday, Mr. Alfred Richards conducted a sale of gas and water stocks and shares. The first lots consisted of a new issue of 4 per cent. perpetual debenture stock of the Ilford Gas Company. It was put up in £100 lots, the greater number of which were sold at par; a few fetching 10s. and £1 premium. These were followed by a new issue of £10 shares (7 per cent.) in the Chigwell, Loughton, and Woodford Gas Company, which realized £14 each. A new issue of 3 per cent. perpetual debenture stock of the Maidstone Gas Company fetched from £75 to £76 per £100 of stock. A few fully paid ordinary £10 shares in the South-West Suburban Water Company (last dividend 5 per cent. per annum) were sold for £14 12s. 6d. apiece; some 5 per cent. preference shares of like nominal value fetching £13 5s. each. A new issue of 4 per cent. perpetual debenture and 5 per cent. ordinary stock of the Cromer Gas Company was next offered. The former was put up in £50 lots, and was disposed of at £100 per pair. The ordinary stock, the last dividend on which was at the rate of 4 per cent. per annum, fetched £85 and £85 10s. per £100. Some 4 per cent. perpetual debenture stock of the Southend Gas Company was sold at the rates of £100, £100 15s., and £101 per cent.; and £481 of new ordinary 5 per cent. stock (last dividend 5½ per cent. per annum) fetched from £100 to £105 per cent. The last lots offered consisted of £500 of consolidated "B" stock of the Tottenham and Edmonton Gas Company, sold by order of Executors. It ranked for a standard dividend of 3½ per cent. per annum, subject to the sliding-scale—the last dividend having been at the rate of 4½ per cent.; and it was sold for £92 and £94 per £100 of stock. At a sale conducted on the previous day by Messrs. Sparks and Son, at Littlehampton, the following prices were obtained for gas shares: Six original shares in the Littlehampton Gas Company, paying 10 per cent., £11 10s. each; six similar shares, £11 12s. each; seven new ordinary £5 shares in the same Company, paying 7 per cent., £7 18s. apiece; and twenty £5 shares, £7 13s. per share. At the same sale, £25 of consolidated ordinary stock of the Arundel Gas Company, ranking for a standard dividend of 5 per cent., was sold for £37.

Gas Poisoning in Belfast.—On Monday last week an inquest was held relative to the death of Ann Thompson, aged about fifty years, who resided alone at 38, Tobergill Street, Belfast. Charles Nicholson, son-in-law of the deceased, identified the body, and stated that he last saw Mrs. Thompson alive on the night of the 14th inst. Since then she had not been heard of until the night of Sunday, the 22nd, when he entered the house in company with the police, and discovered her lying dead in bed, the body being black and swollen. There was a strong smell of gas in the house, and he found subsequently that one of the jets was half turned on. Dr. English said he believed death had occurred more than a week previously, as decomposition had fairly advanced. There were no marks of violence on the body; and, in his opinion, death was due to gas poisoning. The Jury returned a verdict to this effect, and did not attribute blame to anyone in connection with the death.

MANCHESTER CORPORATION GAS SUPPLY.

Annual Report and Accounts.

We have received from the Superintendent of the Manchester Corporation Gas Department (Mr. Charles Nickson) a copy of the report of the Gas Committee, briefly noticed last week, with an abstract of the accounts for the year ending March 31 last. The Committee record the progress of the undertaking as follows:—

The number of tons of coal and cannel carbonized, including the equivalents of enriching materials, and quantity of gas and residual products made per ton carbonized, compared with the previous year, is—

	Coal and Cannel Carbonized. Tons.	Gas per Ton. Cub. Ft.	Coke per Ton. Cwt.	Coke For Sale per Ton. Cwt.	Tar per Ton. Gallons.	Am. Liq. per Ton. Galls. (10 oz.)
1900.	458,273	10,312	12·65	8·49	12·21	26·74
1899.	426,831	10,445	12·97	8·79	12·10	27·60

the production of carburetted water gas, 2,122,163 gallons of oil and 11,584 tons of coke have been used.

The illuminating power of the gas sent from the works was equivalent to 19·40 standard sperm candles, against 19·36 candles for the year 1898-9.

The quantity of gas transmitted from the works shows an increase of 268,771,000 cubic feet, or 6·03 per cent., as compared with an increase of 303,553,000 cubic feet, or 7·31 per cent., in the previous year. The total output and quantity unaccounted for, compared with 1898-9, is as follows:—

	Gas Sent Out. Cub. Ft.	Unaccounted for. Cub. Ft.	Percentage of Loss.
1900	4,725,844,000	164,065,000	3·47
1899	4,457,073,000	171,735,000	3·85

The number of gas consumers on March 31, 1899, and 1900, was respectively as follows:—

	Within the City.	Beyond the City.	Total.
1900	102,668	23,523	126,191
1899	97,312	21,646	118,958
Increase in 1900	5,356	1,877	7,233

The percentage of private consumption was as follows:—

	1899. Per Cent.	1900. Per Cent.
Within the city—Ordinary consumers	80·98	79·45
Prepayment ,,	4·00	4·79
Outside the city—Ordinary ,,	14·74	15·39
Prepayment ,,	0·28	0·37
	100·00	100·00

The number of automatic meters in use at the end of the financial year was 31,436, as compared with 26,751 in the previous year—an increase of 4685, of which 4096 were fixed in the city and 589 in the out-townships. The quantity of gas consumed by these meters was 214,097,000 cubic feet—an increase of 46,824,000 cubic feet, or 28 per cent., on the previous year.

The number of gas fires, cookers, and other appliances on hire on the 31st of March was 9560, and the number of gas-engines in use 1488, as compared with 7336 and 1375 respectively for the year ended March 31, 1899. The quantity of gas used by cookers, fires, and engines is estimated at 350 million cubic feet; being an increase of 12·90 per cent. on the previous year's figures.

During the past six years, the increase in the consumption of gas has been as follows:—

	Cubic Feet.	Increase Per Cent.
Year ended March, 1895	151,032,000	4·28
1896	79,503,000	2·16
1897	419,769,000	11·16
1898 (decrease)	28,819,000	0·69
1899	303,553,000	7·31
1900	268,771,000	6·03
Average	198,968,000	5·63

The total amount of revenue was £654,527, as compared with £594,970 in 1898-9; being an increase of £59,557. The revenue was derived as follows:—

	1899.	1900.
Gas-rentals, &c., within the city	£413,942	£433,843
Do. beyond the city	84,215	88,979
Coke	48,362	64,927
Tar	24,568	34,533
Ammonia water	23,357	31,436
Sundry receipts	526	809
	£594,970	£654,527

The amount paid for coal, cannel, and oil, including the cost of unloading, was £253,076. The cost of material per ton carbonized was 11s. 0·54d., against 10s. 9·98d. for the previous year, an increase of 2·56d. per ton, which, on the total carbonization of 458,273 tons, amounts to £4888.

The advance of 5 per cent. recently given to the workmen, and the increase in the price of all materials used in the manufacture and distribution of gas, have affected the profits of the department during the past year, and will do so to a much greater extent during the current year.

The amount paid in compensation to workmen was £498 7s. 8d., in addition to which the sum of £5000 has been granted to the widow and children of the late Mr. G. E. Stevenson, Engineer, who was killed in the explosion at the Rochdale Road Gas-Works on Oct. 30, 1899.

The gross profit on the year's working was £149,051 12s. The sum of £38,400 16s. 10d. was paid for interest, and £36,686 3s. 8d. has been placed to the sinking fund (as required by the Acts of Parliament under which the money is borrowed). The net profit, therefore, amounted to £73,964 11s. 6d. Of this amount, £52,000 was paid over to the city fund; £1758 8s. 2d. has been placed to the suspense account, on account of the outlay on carburetted water-gas plant; and the balance, £20,206 3s. 4d., has been carried to the contingent fund.

The expenditure on capital and renewals accounts was as follows:—

	Capital.	Renewals.
Gaythorn	£3,634 7 6	£390 0 0
Rochdale Road	6,531 0 5	5,282 11 2
Bradford Road	4,561 16 8	500 0 0
Droylsden	124 2 0	189 17 7
Street-mains stores (Poland Street)	282 10 11	1,212 1 4
Mains	12,649 9 6	2,981 14 6
Services	6,813 2 0	2,676 3 8
Meters	16,242 19 6	9,635 19 11
Stoves	14,300 14 6	323 1 2
Stoves show-room (Deansgate)	5 11 7	—
Street-mains stores (Whitworth Street)	3,570 5 6	—
Oil storage depôt (Mode Wheel)	493 4 7	—
Land and property	6,543 13 6	—
	£75,752 18 2	£23,191 9 4
Less—Transfer to Rochdale Road explosion account—value of clock tower, &c., destroyed	3,500 0 0	—
Transfer to renewals account, value of buildings demolished	1,384 5 10	—
	£70,868 12 4	£23,191 9 4

With regard to extensions and renewals at the Gaythorn station, the following work has been executed: Erection of exhauster-house, and fitting exhauster and engine with connections of a capacity of 160,000 cubic feet per hour, for drawing the gas as required from the Bradford Road works. (This was completed on Sept. 20, 1899, and has continued to work satisfactorily.) The removal of nine old tower scrubbers to make room for a new section of modern washing and scrubbing plant of a capacity of 3,500,000 cubic feet per diem. This plant, consisting of a Livesey washer, a Stevenson scrubber, and a Holmes washer-scrubber, was erected and set to work shortly after the close of the year, and will have an important bearing on the future working results of this station. Other work of importance was done in No. 1 retort-house in the way of more efficiently ventilating the charging-floor and fixing new stone beds for the gearing of the coke conveyors.

During the year, a considerable amount of work was in progress at the Rochdale Road station. The conversion of the "A" retort-house into a meter and governor house, mechanics' shop, and smithy was completed; and the two latter are now ready to receive the new machinery and tools. Two new station meters, each of a capacity of 175,000 cubic feet per hour, and four 24 inch governors, were erected and put into action. The difficult work of removing the old meters and governors, and re-arranging the various connections throughout the works, was partly carried out, and is now approaching completion. The taking down of the clock tower, damaged by the explosion, was effected without accident. A new valve-house, in which all the connections and valves of the several gasholders are concentrated, was erected, and will facilitate the easy and safe working of this section of the works. The purification of the gas with lime was adopted at this station, and commenced in April, 1899; and the results achieved have justified its introduction. Carbonic acid was practically absent from the gas distributed during the year, and the sulphur compounds were reduced to a minimum. Although carbonic acid is not so deleterious an impurity as sulphur, there is no question as to the advisability of its removal; the difference in the brilliancy of a gas-flame with this impurity absent as compared with one in which it is present being very marked.

At the Bradford Road station, the principal work carried out during the year was the erection of a coke-hoisting plant and foundations for the new oil-storage tank. The former work has resulted in a diminution in the production of breeze. The total sales of breeze during the year at all the stations amounted to 20,500 tons. As the difference in value between this product and ordinary coke is considerable, any plant which has for its object the saving of coke from breakage is of great service, and should be extensively adopted.

The work executed at the Droylsden station has been unimportant, with the exception of the improvements to the coal and cannel elevators, including the addition of a 14-cwt. self-indicating weighing-machine.

Attention was paid during the year to the maintenance of the mains and services in good condition. In the cases of a large number of the renewals, advantage was taken of the opportunity to replace with pipes of a larger size, so that a good supply of gas could be delivered to districts in which a great increase in the number of dwelling-houses and other premises had taken place. The 36-inch main which has been laid for the direct transmission of gas between Bradford Road and Gaythorn was completed on Sept. 22, 1899, and was found very useful during the winter. At the Poland Street depôt, new stables, workrooms, and offices are in course of erection. The total length of mains now laid is 1,411,639 yards, or 802 miles and 119 yards; being an increase of 15¾ miles and 108 yards during the year.

The following is a summary of the past year's transactions in the Stove Department compared with the previous year:—

	1899.	1900.
Number of articles sold	1179	941
New stoves purchased for hire	2489	2477
Stoves issued on ordinary hire (including new stoves and re-issues)	3674	4367
Stoves issued on the hire-purchase system	35	22
Stoves cleaned and repaired	962	1350

The whole of the works and plant have been kept in good repair and working condition throughout the year, out of revenue.

Accompanying the report are the accounts and the usual appendices, from which we take the following particulars :—

PROFIT AND LOSS ACCOUNT.

INCOME.

Gas-rental—			
Ordinary meters		£449,808 3	8
Prepayment meters		29,829 15	8
Public lamps		38,307 0	11
Stove-hire		4,876 14	1
Residual products—			
Coke	£64,927 12 8		
Tar	34,532 13 5		
Ammonia water	31,436 5 5		
Carbon	332 17 11		
		131,229 9	5
Rents of cottages, &c.		475 15	11
		£654,526 19	8

EXPENDITURE.

Cannel and coal (including cost of unloading, &c.)	£253,076 9 7
Carbonization (retort men's wages, &c.)	56,805 6 8
Retorts, fire-bricks, &c. (including cost of setting)	13,125 12 6
Repairs and maintenance of works, mains, &c.	67,137 11 1
Renewals of plant, &c.	23,191 9 4
Purifying material and wages	9,208 1 9
Salaries and wages of clerks in Superintendent's office, rental and inquiry offices, and meter inspectors	25,341 5 2
Collectors', receivers', and cashiers' salaries	8,489 7 6
Rents, rates, and taxes	33,416 16 8
Compensation under Workmen's Compensation Act, 1897	498 7 8
Bad debts	667 8 6
Miscellaneous expenses	5,148 16 8
Rochdale Road Gas-Works explosion account	9,368 14 7
	£505,475 7 8
Balance	149,051 12 0
	£654,526 19 8

Interest	£38,400 16 10
Sinking funds	36,686 3 8
Balance (net profit on the year's working)	73,964 11 6
	£149,051 12 0

The balance of net profit is applied as follows :—

Amount paid over to the city fund account	£52,000	0	0
Suspense account in connection with expenditure on carburetted water-gas plant	1,758	8	2
Balance placed to contingent fund	20,206	3	4
	£73,964	11	6

The appendices following the accounts furnish, as usual, statistics as to the progress of the gas undertaking during the year.

The figures in Appendix A—a statement of the lamp and private rental, including meter and stove rents, derived from within and beyond the city—have already been given in the profit and loss account.

Appendix B is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows :—

	Daytime. Cubic Feet.	Twenty-four Hours. Cubic Feet.
Year ended March 31, 1899.	1,188,340,000	4,457,073,000
Do. do. 1900.	1,322,308,000	4,725,844,000
Increase	133,968,000	268,771,000

	Cubic Feet.
Quantity of gas transmitted from works	4,725,844,000
Do. measured and accounted for	4,561,779,000
Loss (by condensation and leakage)	164,065,000, or 3·47 per cent.

In Appendix C, particulars are given as to the results of the working from June 24, 1881, to March 31, 1900. The table contains statistics as to the number of tons of coal carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., for each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 458,273 tons; gas made, 4,725,743,000 cubic feet; yield per ton of coal carbonized, 10,312 cubic feet; illuminating power, 19·40 candles; make reduced to 20-candle power, 4,583,970,000 cubic feet; make per ton, 20-candle power, 10,003 cubic feet; make of coke, 254,204 tons; do. per ton of coal, 12·65 cwt.; make of tar, 26,719 tons; do. per ton of coal, 12·21 gallons; make of ammoniacal liquor (10-oz. strength), 10,748,451 gallons; do. per ton of coal, 26·74 gallons.

Appendix D shows the number of stoves on hire and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 6375 stoves on hire within, and 3185 beyond the city—together, 9560, as compared with 5057 and 2279 (together 7336) at the corresponding date in 1899; so that there was an increase of 2224. The number of meters in use was 126,191 in 1900 and 118,958 in 1899. There was last year a net increase of 7233 on the number for the preceding year. Of the total number at work on March 31 last, 119,967 were on hire, as compared with 112,076 at the close of the financial year 1898-9. The number of prepayment meters on hire on March 31 last was 31,436—an increase of 4685 on the number at the close of the preceding year.

From Appendix E, we learn that the gas-mains laid last year within the city amounted to 23,708 yards, and beyond the city to 12,674 yards—a total of 36,382 yards, or 20½ miles 302 yards. The mains taken up were 7912 and 642 yards respectively—a total of 8554 yards, or 4¾ miles 194 yards. The total net increase during the year, therefore, was 27,828 yards, or 15¾ miles 108 yards. The total length of mains laid up to March last was 1,411,639 yards, or 802 miles and 119 yards.

Appendix F consists of a statement showing the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from 1862 to March 31 last. The figures for the past financial year are as follows: Profit, £149,051; paid over for improvement purposes, £52,000; carried to contingent fund, £20,206; borrowed money owing, £1,026,456; and excess of assets, £1,126,834. The profit of £149,051 is appropriated thus: Interest, £38,400; liquidation of mortgage debt, £36,686—leaving a surplus of £73,965.

BIRMINGHAM CORPORATION GAS SUPPLY.

Increase in the Price of Gas—The Retirement of Mr. Edwin Smith.

At the Meeting of the Birmingham City Council last Tuesday, the report of the Gas Committee noticed last week (p. 233), containing a recommendation that the price of gas should be increased by 3d. per 1000 cubic feet, with a proportionate increase for public lighting, from the September reading of the meters, was presented.

Mr. J. H. LLOYD, in moving the approval of the recommendation, reminded the Council that, in making the annual statement of the Gas Department last May, he told them that if the reported demands of the coalowners were successful, there must undoubtedly be a serious rise in the price of gas. It was now necessary to decide what that rise should be. According to a carefully-prepared estimate, the increased cost of coal and oil in the current financial year would be £140,000; and to this must be added an increase in the cost of the materials for manufacture—such as stores, iron, fire-clay goods, &c.—and labour, with a further £2000 for rates and taxes; making a total of £162,000 more than last year. On the other hand, they hoped they might get a certain extra amount for residuals. They estimated £25,000 on account of the improved values of tar and coke, or a net increase to be provided for of £137,000. The higher prices for gas could only be applied this year to the six winter months' output; and it would require an increase of nearly 10d. per 1000 cubic feet to provide in the six months for the deficiency of the year. By sundry savings which it was hoped to make, and by suspending for the year the usual provision for depreciation, the deficiency of £137,000 could, it was estimated, be reduced to £79,000. This would require an increase of 5½d. per 1000 feet on the output for the six months; but, as explained in the report, the contribution to the improvement rate for the year 1900 had already been provided—that was the £29,821 voted in May last; and the Committee therefore suggested to the Council that no provision should be made from the current year's income for any contribution to the rates. They proposed, in fact, until they came into more favourable circumstances, to revert to the former practice of providing the contribution to the rate of 1901 from the income of the Gas Department in that year. By this means it would be possible, at any rate for the present, to limit the increase in the price of gas to 3d. per 1000 cubic feet. The Committee made this recommendation to the Council with hesitation, knowing that 3d. was a very small rise indeed in face of the enormous advance in the price of coal, oil, and other materials. They would have preferred to be able to pay the contribution as usual at the close of the current financial year, and to have made the usual allowances for depreciation. They looked at the circumstances, however, as abnormal; and though they regretted the action of the coalowners in raising the price of coal excessively, they did not wish to hinder the progress of the undertaking by checking the extensive use of gas-engines as a substitute for other forms of motive power which was now taking place on a considerable scale. It must, however, be clearly understood that the present position could not remain, and was only a temporary method of meeting an emergency. The future would depend upon the state of the market for gas coal. If the high prices and restrictions on output were maintained next year, it would be necessary to ask for another advance. But the Committee hoped that by then wiser counsels might prevail. The existing state of the gas-coal market was to a great extent artificial. There was undoubtedly at present a large quantity of gas coal yet in the market; and already new collieries were being opened up. The general effect of an advance in price was to check consumption; and as increases in the price of gas—many of them large ones—were taking place all over the country, the effect would probably be felt in another twelve months, and would tend to reduce the price of coal. The Gas Committee hoped the very moderate advance for which they were now asking would not have the effect of materially checking consumption. It was well known to gas suppliers that high prices of fuel tended to a greater use of gas-engines and gas cooking-stoves; and it must be remembered that here there was a permanent substitution of gas for other fuel, which strengthened the department in bad times. In the first three months of the current financial year, the output of gas-stoves had reached 1100, as compared with 860 in the corresponding period of last year.

The motion having been seconded,

Mr. E. PARKES, M.P., expressed the opinion that the Committee were sailing very near the wind. He said the average increase in the price of gas which was taking place throughout the country was about 6d. The Committee were proposing to provide £45,000 against an extra expenditure of £137,000. It was evident that this could not last; and he thought it would have been wiser to have asked for another 1d. or 2d. He feared the result of not doing so might be a larger increase eventually.

Mr. LANCASTER said it seemed to him to be very bad finance to dispense with putting aside £50,000 for depreciation, and to suspend the contribution of £30,000 to the rates. This must mean an increase of 3d. in the rates. They were, in fact, making a present to the consumers, outside as well as inside the city, of 3d. per 1000 feet. He would rather take the bull by the horns, and increase the price of gas by 6d. and pay their way.

The LORD MAYOR (Alderman Beale) said there appeared to be some misunderstanding. The report did not say that the Gas Department would not contribute the usual £30,000 to the rates, but that the sum would be provided out of the profits of the year 1901, and not out of those of the present year.

Mr. LLOYD said the position in relation to the contribution of the Gas Committee to the rates was that the £30,000 profit made in the year that was closed had been paid over in relief of the improvement rate of the present year. The intention of the Committee was that the £30,000 for

next year should be paid at the close of the financial period, as was formerly the case. The price of gas for next year would have to be settled in view of this circumstance. No doubt the Committee were undertaking considerable risk; but they trusted that an extra 3d. would just help them through the present year, and they would then look at the position for the year following.

The motion was carried.

Mr. Lloyd then moved that the Committee be authorized to advertise for, and to appoint, a Secretary of the Gas Department at a salary of £1000 per annum, in the place of Mr. Edwin Smith, who desires to retire early next year. They were about, he said, to lose one who had been a faithful servant to the Corporation and the city. Mr. Edwin Smith was chosen by Mr. Joseph Chamberlain, when he was Chairman of the Gas Committee, soon after he had negotiated the purchases from the old Companies, and he had successfully organized the Corporation department combining the two Gas Companies. Mr. Smith was a man of great ability, and before he went to the Gas Department was widely known as Secretary of the Midland Institute. No one could have been more faithful to the interests of the department, or taken a higher standard in regard to all his work. Justice to every consumer and no favouritism of any kind were characteristics of his labours. Gifted with a clear and logical mind, he had always been ready to grasp the complicated details of the great undertaking; and now, while in the full vigour of life, he desired to avail himself of the superannuation scheme rather than continue to work at the Gas Department when he began to desire rest. None but the Gas Committee knew how much the community had to thank Mr. Smith for his earnest, incessant zeal for the welfare of the undertaking; and their regret at losing his services would be great. He (Mr. Lloyd) was sure he was expressing the wishes of the whole Council when he said he hoped Mr. Smith might be long spared to enjoy his well-earned rest. Their need now was to find a fitting successor. He must be a man of ability, accustomed to the management of men, able to grasp the details of the department, trained to thoroughly understand and master the innumerable problems that would be likely to beset a man in his position. The word "Secretary" in no way described all that was expected. He must either already have a thorough knowledge of the commercial and financial sides of gas-making, or he must have the requisite patience and ability rapidly to grapple with the principles and details, and master them. He must have the accurate knowledge which would enable him to bring matters before a Committee with all the information ready, so that the essential points could be considered and decisions made without delay. He must also have the gift of organization for a large office of clerks would be under his headship; and he must be courteous to every one of the 60,000 consumers, even though one or two were occasionally unreasonable and irritating. The present Secretary had received £1250 per annum for very many years; but the Committee now proposed that £1000 a year should be the amount of salary advertised. No one who had any knowledge of the value of such an office would consider this sum too great; but the Committee hoped it was large enough to induce some really first-rate men to apply.

Mr. Bishop, in seconding the motion, said he had known Mr. Edwin Smith longer than any other member of the Gas Committee, and he could endorse every word the Chairman had said with respect to the great debt they owed him. They all hoped he would have long and pleasant enjoyment of his retirement.

Alderman Cook inquired, with respect to Mr. Smith's successor, whether the Committee had looked carefully round to see if there was any member of the municipal staff who might be promoted to the position.

Mr. Lloyd said they had looked round the department, and had also taken a wider view; but they had no one in their minds who was likely to supply what they wanted.

The motion was carried.

DEVONPORT GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday—Mr. A. Bennee in the chair.

The Directors in their report stated that their contracts for the supply of coal were fortunately made before the great advance in price; but the new contracts had been entered into at much higher figures, and this, with the increased cost of almost every kind of material, had necessitated an increase of 6d. per 1000 cubic feet in the price of gas. This increase would not continue longer than was absolutely necessary. The sum derived from the sale of gas and from meter-rents amounted to £28,422, as compared with £27,255 in the preceding year. Residuals also realized £2873 more. The total income was £39,312, and the total expenditure £36,511; leaving £2801 to be carried to the net revenue account. The Directors reported with great regret the resignation of Mr. R. C. Smith, who had been a member of the Board for 51 years, and had ably occupied the chair for upwards of 41 years; and they also recorded with regret the death of Mr. J. T. Philp, a member of the Board, and of Mr. John Williams, the Secretary. They notified that in place of Mr. Williams, Mr. F. T. Trethewy had been appointed Secretary.

The Chairman, in moving the adoption of the report and accounts, said there had been an increase of nearly £4000 in the cost of the coal carbonized; but more than £3000 of this was accounted for by the rise of something like 3s. per ton as compared with the preceding year. Wages showed an advance, owing to the larger quantity of coal carbonized, and extra work which had been done in various parts of the town in laying new mains and replacing old ones. Another item of expenditure was due to one of the holders. This holder had given trouble from the start. Owing to the sinking of the foundation, it was not quite perpendicular; and as it became worse with lapse of time and under pressure of storms, it had to be put right. On the credit side of the account, there was an increase of about £1100 in the revenue from the sale of gas, and of about £40 in meter-rents. The sales of coke turned out exceedingly well. They had no contracts running when the price went up, and they made the most of the advance, with the result that there was an increase under this head of nearly £3000. The balance of net revenue was £9295, as compared with £10,925 last year; but, considering what they had done, they might congratulate themselves that it was so good. The electric light was coming; but they had no fear that it would affect the prosperity of the Company. They would probably lose a customer here and there; but for one lost they would gain two or three. In Devonport, as in other places, the electric light would simply stimulate the demand for gas. They had had one unfortunate experience during the year. At the time when they wanted good coal and plenty of gas, a fire broke out in two of the coal-stores. All they could do was to use the coal as quickly as possible; but they were put to the expense of moving it, in order to prevent the destruction of the whole quantity. The coal difficulty had been very great. Not only did the price go up 3s. per ton, but freights advanced by 2s. or 2s. 6d. a ton. They had fortunately made contracts both for coal and freights before the advance; but in the current year they would feel the effect of the increase in all kinds of material. As to the future, incandescent burners would, no doubt, give a great stimulus to the consumption of gas. They were the first Company west of London to introduce incandescent burners for public lighting. Devonport was one of the worst lighted places in Great Britain. He knew towns of similar area which had four times the number of lamps. People cried out for better gas; but those who cried loudest often had bad burners, and did not get the full value of the gas when they had it. New houses in Devonport were being fitted with ¾-inch pipes, which was absurd, and led to complaints of want of pressure, when all that was needed was room for the gas to pass. In old houses, there were often worn-out and corroded pipes which no one ever thought of renewing. Gas of high illuminating power was, for these and other reasons, seldom worth what it cost to produce; and it was satisfactory to find that Parliament had come to the conclusion that 14-candle gas was quite good enough. The main reason for the change in the opinion of Parliamentary Committees on this subject was that new light had recently been thrown on the course of events in Germany with reference to the illuminating power of the gas. In Berlin—the best-managed Municipality in the world—incandescent gas-burners were in use everywhere, and had replaced the electric light in the streets. He might mention, too, that in Magdeburg and other places gas of from 7 to 10 candles was made, and everybody used incandescent burners. In this country, the progress of incandescent lighting had been hindered by the dearness of the mantles and burners; but they had a great deal to hope for from the cheapening of them. When they first put incandescent lights into the lamps in Devonport Park, they paid 32s. 6d. each for "D" burners; while the present No. 4 burner, which was better both in its construction and in the results it gave, cost only 5s. 6d. He thought that the Welsbach Company would see that it was advisable to further reduce their prices, and that incandescent burners would be ultimately as generally used in this country as on the Continent. With regard to their relations with the Corporation, their motto was "Peace." They wanted peace and hoped to have it. At the same time, they wanted fair play; and they did not consider that in regard to the supply of gas to the district recently added to the borough they had been treated quite as fairly as they should have been. They were asked by the Corporation to carry the mains to the boundary of the borough as it formerly existed to supply lamps 100 yards apart, as against the usual 25 and 40 yards. They did not object; and, anticipating the demand of the future, they ordered mains, which, after some delay, were now delivered. In December, 1898, they were asked to quote terms for the supply of gas to the added district. They might have declined to send terms; but they did not. Without waiting for them, the Council applied to the Plymouth Gas Company for a quotation; but that Company naturally said they would not do the work at any price. As to their own quotation, they said to the Corporation: "If you will pay the cost of the mains and services, we will supply gas at the same price as in the town, scattered though that district is." The Corporation replied that these terms were by no means acceptable, and that they thought the Company would have been glad to supply the district. To this the Company wrote suggesting an interview; but they heard no more from the Corporation until November, 1899, nearly a year after the former communications. Then the Corporation wrote, not in answer to their suggestion for an interview, but complaining of certain matters. No interview had taken place, and nothing had been done; but it was not fair for the Corporation to say, as they had done before a Local Government Board Inspector, that the Company refused to supply gas on any other terms than those he had named. If the Corporation had met them in a reasonable way, he thought they would have come to terms, and the district would have had a supply of gas. They did not want the work, and were sure there was no profit to be made out of it; but they were willing to undertake it if they could protect their shareholders and present consumers.

Mr. A. W. White seconded the motion.

Mr. Moon said the shareholders had not heard the other side of the story. The Corporation paid for gas they did not consume, through lamps not being alight. As to the outlying districts, many of the people would be consumers of gas if they could get it.

The Chairman explained that one of the lamplighters called at the Police Office at eleven o'clock each night and obtained a list of the lamps reported to be out; and, if possible, all were relit. The fact was the Corporation got a very great deal more than the Company were under obligation to give them. They supplied 14-candle gas instead of the 12-candle gas provided for by their Act, and they gave at least 5 cubic feet of gas per hour in the public lamps, instead of the 4 cubic feet contracted for. Besides this, they lit the lamps by Greenwich time and extinguished them by local time; so that the town had the advantage of 20 minutes extra lighting. For all this the Corporation paid nothing. Answering a question on the point, the Chairman explained that automatic meters were not a great success in Devonport. They had a rule for the supply of ordinary consumers that 30 yards of service-pipe should be laid free, and that for anything beyond this the consumer should pay. They could not make this charge in the case of automatic meters, and they did not care to put them in where the service-pipe was more than 30 yards long.

The report was adopted, and the usual dividends were declared.

A vote of thanks was passed to Mr. R. C. Smith, the late Chairman, for his long services as a Director; and the Chairman, Directors, and officers were also thanked for their attention to the business of the Company.

The Leeds Gas Committee have decided to borrow about £70,000, chiefly required for new mains. A portion of the money is to be spent on the York Street works.

THE LEAMINGTON CORPORATION AND THE GAS-WORKS.

A Special Meeting of the Leamington Town Council was held on Monday last week, for the purpose of receiving the report of the Town Clerk (Mr. H. C. Passman) on his interview with the Solicitors to the Gas Company relative to the withdrawal of the offer to purchase their works. At the last meeting of the Council, it may be remembered (*ante*, p. 173), he was instructed to ascertain whether the Company would consent to such withdrawal. He now stated that he had been unable to obtain any definite assurances from the Company; but a meeting of the Directors had been called for the following day, after which the Company would be in a position to carry the matter further. In the meantime, it was understood no steps would be taken by either side in regard to the appointment of arbitrators. It was understood that some definite proposition would be put before the Council at their next monthly meeting; but that if any important developments should occur before that date the Mayor would call a special meeting. The Directors held their meeting on Tuesday, and, after some discussion, decided that they were not in a position to come to a definite conclusion on the matter until they had been more fully advised on the points of law involved. It was decided that Counsel's opinion should be taken on these, and the meeting was then adjourned for a month.

PURCHASE OF THE SHIPLEY GAS COMPANY'S WORKS BY THE DISTRICT COUNCIL.

An agreement has been come to by the shareholders of the Shipley Gas Company and the Shipley District Council by which the latter acquire the Company's undertaking. The agreement has already been signed on behalf of the Shipley District Council, and will be signed on behalf of the Company after the usual statutory meeting which in such a case has to confirm the resolution of the shareholders passed at the general meeting on Wednesday last. No official information is forthcoming as to the price to be paid; but it is stated by the "Bradford Observer," on unquestionable outside authority, that the terms of purchase are on the basis of 30 years' profits, which means a sum of £228,000. The Company have been paying 10 per cent. on £48,000 worth of ordinary shares, and 7 per cent. on £40,000 worth of preference shares. In round figures, the annual profit has been £7600; and, at 30 years' purchase, this would produce the sum named as the purchase price. The ordinary shares of the Company have generally had a market quotation two-and-a-half times their original value; and the preference shares have been quoted at a proportionately high figure. The price to be paid by the Council is on the lines of many similar transactions; "even had it been higher, municipal experience throughout the country is uniform in showing that the acquisition of gas undertakings at anything like a reasonable cost has proved remunerative to the communities concerned." The Council will go to Parliament next session with a Bill for the purpose of confirming the transaction, and for other purposes of local government; and they will insert clauses in the Bill enabling Bradford to purchase the Heaton portion of the present Company's business as a going concern. Probably, similar facility will be offered to Baildon.

Commenting on the matter, our contemporary remarks: "The Shipley District Council have undoubtedly strengthened their position as a local governing authority by acquiring the undertaking of the Shipley Gas Company. Subject to what are really formalities, the transaction is an accomplished fact. A statutory meeting of the Company's shareholders has yet to be held; but its decision can hardly vary from that of the meeting of shareholders last Wednesday. Parliamentary sanction to the transaction has also to be obtained, especially as the Shipley District Council will insert clauses in their Bill with a view to Bradford (in reference to Heaton) and Baildon acquiring their respective interests in the concern. According to precedent, the Shipley District Council can hardly have done wrong, for local authorities have uniformly profited from taking over gas undertakings. Thirty years' profits is a not uncommon valuation for such a transference—some towns have paid on the basis of a larger period. The point for the Bradford City Council to consider is whether Shipley will not by this stroke have so emphasized its claim to be considered a separate local authority, that the best course for Bradford to pursue is to include in its next Parliamentary Bill a request for the inclusion of Shipley within the Bradford area."

New Zealand Coal Supplies.—According to a Reuter telegram, dated the 24th inst., from Wellington (N.Z.), the scarcity of coal in the colony has had the effect of raising the price, and the mines at present working are unable to cope with the demand. The position of affairs has been debated in Parliament, with the result that the Premier indicated that, unless the lessees of certain large and valuable coal-bearing lands are prepared to work them, steps will shortly be taken to determine their leases. The "New Zealand Times" advocates the Government throwing open other coal-bearing lands, and offering every facility for private persons willing to work them.

The Cowlyd Water Board Negatives their Engineer's Recommendations.—At the last meeting of the Cowlyd Water Board, the Engineer (Mr. T. B. Farrington) presented a long report, in which he urged the Board to consider the question of increasing the water supply from the trunk main. He suggested that a new 12-inch main be laid from the intake at Dolgarrog down to Conway, and pointed out the absolute necessity of service reservoirs being constructed at Deganwy, Penrhyn, Colwyn Bay, and Llysfaen, to receive an unlimited supply during interference with the transit main. Mr. Hugh Owen called attention to the financial position of the Board. He said they owed the bank £18,326; and, under the circumstances, he did not think they ought to contemplate laying an additional main. He proposed that the recommendation be not carried out. The Engineer remarked that the expenditure of a few hundred pounds at the present juncture would save the Board spending some thousands of pounds later. Eventually the recommendation was not entertained. A resolution was passed advising the constituent authorities to provide themselves with reservoirs of a sufficient capacity for their respective districts.

THE PROPOSED ROYAL COMMISSION ON COAL SUPPLY.

Our readers may remember that some few months ago Mr. A. D. Provand, the member for the Blackfriars and Hutchesontown District of Glasgow, addressed a letter to the First Lord of the Treasury, suggesting the appointment of another Royal Commission to inquire into the question of the coal supply, and calling his attention to some facts which have arisen since the last Commission reported, in 1871, on the output, export, and probable duration of our coal. We gave the letter in the "JOURNAL" for the 3rd of April last (p. 881). Mr. Provand is still of opinion that further inquiry is urgently called for; and last Thursday he sent Mr. Balfour the following letter on the subject:—

On the 20th of March, I wrote to you suggesting the appointment of a Royal Commission on the coal question. Your replies, both in the House and by letter, suggested no doubt as to your belief in the importance of the subject to the country; but you were reluctant to ask a number of competent men to spend time in conducting an investigation which, as advised, you did not see would be likely to be followed by practical results. You, however, added that this did not apply to a more limited inquiry, relating to the best use to which we might put our existing supply of Welsh steam coal. On this point you reserved your judgment.

Since I wrote to you, the question has come forward, and now occupies a leading place among those to which the public pay attention. What is called the "coal famine" has increased, and prices for both domestic and manufacturing purposes threaten to be higher than they are at present.

With respect to your desire that there should be some practical issue to place before a Royal Commission, permit me to say that there are many to which I might refer besides the two I suggested in my letter of the 20th of March. Of the first I then said: "We have in Wales the most valuable steam coal for naval use in Europe, of which the supply is limited. It is an important arm of defence; but it will not remain so permanently unless we reserve it for our own use." Since I drew attention to this, the question has become acute. This is shown by the number of questions asked in the House and the articles and correspondence in the Press. It is no exaggeration to say that there is a growing national concern as to the future of our naval coal supply.

The other point to which I then referred related to coal development in the United States. Down to 1896, an increasing output was accompanied by a declining price, until the average cost of coal in that year at the pit's mouth was 4s. 5d. in the United States, while it was 6s. 4½d. in the United Kingdom—*i.e.*, our coal was about 50 per cent. dearer. I believe the difference will become greater. Since then coal has increased in price in the United States, but not to the same extent as here; and their production is rapidly advancing. In a preliminary statement which I have just received from Washington, I find that the output for 1899 was 231 million tons, against 196 millions in 1898; showing an increase of 35 million tons in the year. For the first time their output has exceeded ours, and the increase, both actual and relative, will probably be maintained. Even if there should remain some advance in price in the United States, it will, I think, not equal the increase in this country, because, on account of the greater accessibility of their coal deposits, the output per miner is quite 50 per cent. more than in the United Kingdom.

The increasing production and increasing relative cheapness of coal in the United States must be fraught with momentous consequences to our manufacturing industries when any slackening of the present activity takes place. This is only one of many points which should receive attention, such as: The future production in the United Kingdom and other countries—Australian and Oriental, as well as European and American; our export of coal, and the possibility of ultimate importation; the relative cost in different countries; and the effect of present prices, and any increase in these, on our industries.

It would make this letter too long to enumerate the matters which might properly be referred to a Royal Commission. The first thing is to ascertain the facts; and even if no recommendations of moment were made by the Commission, it would, generally speaking, still be of enormous advantage for us to know the truth as far as it was ascertainable, so that we might set our house in order, and prepare for what may possibly take place.

In your reply, you said you thought the investigation could be adequately accomplished by private individuals. I feel satisfied that this is not the case. There are differences of opinion among experts, and these are brought before the public in a merely academic way in letters to the Press or in papers read at societies, where they cannot be subjected to adequate examination. No private inquiry could possess the influence or authority of a Royal Commission; and its means of collecting evidence would be totally beyond the power of any body of private inquirers.

Permit me to say, in conclusion, that it is impossible to over-rate the importance of this question to the nation; and I hope the ripening of public opinion which has taken place since I addressed you on the subject will now be considered sufficiently pressing to prompt the Government to appoint a Royal Commission to consider the question in all its bearings.

FELLING A CHIMNEY AT THE SALTLEY GAS-WORKS, BIRMINGHAM.

The Saltley Gas-Works of the Birmingham Corporation were the scene, last Tuesday, of a somewhat sensational operation, which happily was performed without injury to life or limb, and was only attended by the breaking of a water-pipe. It consisted in felling a large chimney-stack nearly 150 feet high; and this feat was accomplished under exceptionally favourable conditions. The following account of what took place is reproduced from the "Birmingham Daily Post" of Wednesday: "The chimney belongs to one of the retort-houses erected when the works were established in 1856, and which are being removed in con-

nection with the scheme for the reconstruction of the station at a cost of £350,000, sanctioned by the Council eighteen months ago. A considerable portion of the ground had been cleared; and as the adjoining space is largely a coal-yard, the spectators were able to have a clear and safe view of the operations and the catastrophe they were designed to bring about. It is not an uncommon thing to bring down even the whole of a lofty chimney-stack at one fell swoop by the plan adopted yesterday. In this case, however, the chimney, which was originally 147 feet high, had had 40 feet taken from it brick by brick. This was done by steeplejacks, who reached the top of the chimney in the usual way by means of holdfasts and jointed ladders. This method, however, was found to be very wasteful, as the bricks, after being thrown down from such a height, could not be used again; and Mr. Hack, the Engineer of the works, at last consented to the job being finished by 'felling.' Three or four days last week were occupied in removing from the chimney on one side the courses of brickwork to a height of about 6 feet from the ground; the cut extending diagonally about half-way through the base, which is 14 feet square outside, and 7 feet square inside. The masonry was replaced temporarily by stout wooden props, which had to support nearly half the weight of the truncated chimney and its square base, or supporting tower. The latter rose to a height of 27 feet, while the chimney above, commencing with a diameter of 14 feet, tapered to about 9 ft. 4 in. at the place where the steeplejacks had left off. Had the chimney been dealt with as a whole, the weight supported by the undercut base would have been 580 tons; and the props had to help to hold up quite 400 tons, made up of 1¼ million bricks. Little was left to be done at ten o'clock yesterday morning, when Mr. Hack, with other officers of the gas-works, and the representatives of the Contractors (Messrs. Jeffrey and Sons, of Birmingham), and a few others, assembled to witness the downfall of the chimney of the old No. 1 retort-house. The workmen, creeping under the doomed structure, chipped away as much as they could of the flues and the 9-inch lining of fire-bricks; the side which had been undercut being the blank side of the stack. Then shavings were brought into the opening, and piled up round the wooden supports. Upon the shavings were heaped old bits of planking; and then tar was poured on to give the bonfire a good start. On the signal being given that all was ready, the workmen were cleared out of the roped space round the chimney and out of the neighbouring workshops and retort-houses. Officials, visitors, and workpeople took up positions on the coal stacks and other elevated points, and then a man was seen carrying a shovelful of live coke from the companion retort-house. Thrown into the opening, this soon set everything cracking. The flames lapped the wooden props and the sides of the square base, and sent out a dense black smoke. Some of the smoke ascended the chimney; and thus from the top there fumed a pathetic farewell cloud. The sight was not unpicturesque, but it did not last long. In a few minutes the chimney was seen inclining in a minute degree to the right and then to the left as the props felt the fire. Then it seemed to pull itself together as though resolved to die as a well-built chimney should. Twelve minutes after the fire had been lighted, the props were heard cracking. The chimney bowed stiffly, but with dignity; halted a moment, as though to have its farewell acknowledged by the executioners; then solemnly bent forward. Almost silently the stoop increased—first slowly, then more rapidly. When at an angle of about 60° to the ground, a momentum had been gained which made the rest of the fall seem instantaneous. The ground was shaken by a dull thud-like detonation, which must have suggested to the gas-makers the firing which accompanies the opening of a large retort. Where the chimney had stood out against the sky there was nothing but blue ether and sunlit cloud. In the line of its fall, for a few seconds there was nothing to be seen but a long dense yellow and white dust-cloud, rising some 40 to 50 feet above the ground. Almost suddenly, the cloud disappeared, and what had been the chimney appeared as a long white and red bank of disintegrated brickwork, with bits of iron banding wriggling about in places like serpents which had been driven out of their holes by the shock. The chimney-fellers employed by the Sub-Contractors (Messrs. James Rees and Son, of Smethwick) had done their work well. But for a slight twist or two where the masonry had almost given way about half-way up, the stack fell wholly and squarely. The centre line of the mass of bricks was at its farthest point from the base scarcely 3 feet out of the line marked out for it."

ELECTRIC LIGHTING NOTES.

On Thursday, the 19th inst., the electric light and dust destructor works which have been in progress in Gloucester during the past twelve months were formally opened by the Mayor (Mr. F. Treasure), at the invitation of the Electric Lighting Committee. The generating station has been erected on a site in the south-west portion of the city, and the installation has been carried out by Mr. Robert Hammond. There are at present in use for street lighting 44 arc lamps of the Brockie-Pell single-carbon type, grouped in four series of nine and two series of four. The total extent of cable laid is 23¾ miles. The generating plant in operation consists of two combined sets. The larger one is composed of a triple-expansion engine of 500-horse power coupled to two Silvertown dynamos, equal to an output of 300 kilowatts at any pressure between 440 and 500 volts. The smaller set consists of a two-crank compound engine, driving two dynamos having a combined capacity of 150 kilowatts at the above-named pressure. The destructor, having a burning capacity of 50 tons per 24 hours, will consist of two cells side by side; and it will have to deal with 150 tons of refuse per week.

The Rochdale electricity works are rapidly approaching completion, and it is expected that the Corporation will be in a position to supply current by the end of August or the beginning of September. The area of the site is 2838 square yards; but only about half of this ground is at present covered. In the engine-room there are two 275-horse power engines, and space is provided for a third. The boiler-house contains two 30 feet by 8 feet boilers, fitted with mechanical stokers; and there is room for another. The dynamos are designed to furnish a 440-volt supply to the town and a 500-volt supply for tramway traction purposes. The Corporation have put down cables to enable them to furnish current to customers in their compulsory area; but the limits of supply will, of course, be extended as the demand for the current increases. The system adopted in Rochdale is the low-tension three-wire. The price to be charged for the current is 6d. per unit for lighting purposes and 3d. per unit for power. Meters will be supplied by the Corporation. The erection of the works and the installation of the plant have been carried out under the superintendence of Mr. T. A. Lacey, the Engineer to the Corporation; and the cost will be about £30,000.

Last Wednesday, the President of the Board of Trade received a deputation from London Electric Light Companies, who desired to have the Board of Trade regulation as to the supply of electricity amended so that they could change from 100 volts to 200 volts by agreement with the consumer, or, failing agreement, by arbitration. The regulation at present specifies that no change shall be made in the pressure of the supply to any premises except with the consent of the consumer. Mr. Ritchie was accompanied by Sir Courtenay Boyle, the Hon. T. H. W. Pelham, Mr. Garnham Roper, and Mr. A. P. Trotter. Professor Kennedy said the Westminster Company were the first to change over from 100 to 200 volts; and all the other London Companies present were in various stages of following suit. An infinitesimal number of consumers could prevent the change so long as the Board of Trade regulation remained in its present form. They suggested that, instead of the change from 100 to 200 volts being made with the consent of the consumer, it should be settled by an arbitrator appointed by the Board of Trade. Mr. Ritchie, in reply, said perhaps the difficulty could have been avoided if the Companies had adopted a more conciliatory tone to the consumers when they desired to make the change. The consumers at present had the right to refuse, and they might *bona fide* consider that there was danger in raising the voltage from 100 to 200. Certainly, they ought not to be told that their supply would be cut off if they did not accede to the change. General Webber, on behalf of the Companies, said it was their last wish to use threats. It was in the interest of the public in London that the pressure generally should be raised from 100 to 200 volts. Mr. Ritchie admitted that it was a strong order for a few persons to stand in the way of the application of the new system. But these people were within their rights; and if the Board assented to the proposal of the Companies, they would be over-riding those rights. The Companies could not refuse to supply any consumer with 100 volts if he desired to have it. He would take the matter into consideration; but he hoped the Companies would use more conciliatory methods with their customers. The deputation, having thanked Mr. Ritchie, withdrew.

When the Exeter Corporation acquired the electric light undertaking in 1896, it was with the knowledge that at an early date they would have to remove the works to a larger and more convenient site. All the reports presented on the subject indicated that the existing site was already fully occupied, and that large extensions were impracticable. Since that time, the number of customers has increased from 150 to 400, and the lamp connections from 7300 to 19,800. Under these circumstances, removal to a larger area has become imperatively necessary. On Wednesday last, the Electric Lighting Committee presented to the Town Council a report by Mr. H. D. Munro, the city Electrical Engineer, recommending the erection of new works on land belonging to the Corporation which has the advantage of railway and water communication. Mr. Munro recommended that the main building should be laid out in blocks of 1000-horse power, and that, as a beginning, 2½ blocks, or half the proposed station, should be erected. The greater part of the equipment of the present station is to be worked into the new scheme. The existing system of supply is the single-phase alternating, with a frequency of 100 alternations per second. He is of opinion that, under the economical conditions of the new works, this system will give results equal to any direct-current system, but that the frequency should be altered to 50 alternations per second. He roughly estimates the cost of the scheme at £41,550, of which £33,500 is for the building and plant, £2000 for the site, £3000 for altering and removing existing plant, and £3050 for main feeders from the new works to the city. The scheme, which was endorsed by Mr. T. P. Wilmshurst, Borough Electrical Engineer of Derby, was adopted. The City Council have in view the erection of a refuse destructor. Mr. Wilmshurst said in his report that a destructor might give 100 to 140 horse power available for the purposes of the electricity station; but if the electric lighting undertaking was to derive any appreciable benefit from it, he advised the Committee not to undertake the obligation of contributing towards its cost of maintenance.

Increases in the price of gas, as our readers are aware, have been pretty general all over the country, and in some cases they have evoked the foolish threat to resort to electric lighting. But the cause which operates to make gas dear—the high price of coal—must, of course, affect the cost of producing electricity. This fact has been brought home to the Electricity Committee of the Lancaster Corporation, who lately, on the reception of reports from the Borough Accountant and the Engineer as to the extent to which the estimate of income and expenditure for the current financial year will be affected by the advance in the price of coal, resolved to raise the charge for electric current from 3d. to 3½d. per unit for motive power, and from 4½d. to 5d. per unit for lighting. When the minutes came before the Town Council last Tuesday for confirmation, Mr. Heald, said the increase proposed was necessitated in consequence of the enormous rise in the price of coal. No doubt it would cause a certain amount of complaint; but he should like to point out to those who used electricity for motive power that the increase the Committee suggested was only about 17½ per cent., whereas if they used coal they would have to pay 50 to 60 per cent. more. The increase in the price of current for lighting purposes was not so great, being about 12 per cent. Unfortunately, at present coal was the only force available for producing electricity. Other forces were being made use of in different localities, though not to any great extent; but he thought if the price of coal continued as at present, or, as some people seemed to think it would, increased considerably, it would encourage people of inventive minds to see if they could not develop some of the forces of Nature for the production of power which could easily be converted into electricity. In Lancaster, they were not unfavourably situated for making use of some of these forces, having water power in their midst. The Committee did not recommend the increase with the view of making a profit, but to enable the Electricity Department to pay its way and lay by a substantial reserve. Alderman Smith moved, as an amendment, that the minutes be passed, with the exception of that relating to the increase in the price of current supplied for motor purposes. Mr. Bowness seconded the amendment; but it was negatived, and the minutes were confirmed.

CLAY CROSS WATER-WORKS ARBITRATION.

A Settlement Arrived At.

At the Westminster Palace Hotel last Friday, the Arbitrators in the above matter (Messrs. W. B. Bryan and Charles Hawksley, MM.Inst.C.E.) attended with the Umpire (Mr. G. H. Hill, M.Inst.C.E.) for the purpose of determining the price to be paid by the Clay Cross Urban District Council for the undertaking of the Clay Cross Water Company. The Company were represented by Mr. Freeman, Q.C., and Mr. Honoratus Lloyd; the Council, by Mr. A. J. Ram, Q.C. At the opening of the proceedings, Mr. Freeman stated that before the parties came into the room they had been able to arrive at a satisfactory solution of all figures and questions of that sort, so that they both had a basis on which they were able to discuss the matter privately. The concern was absolutely a local one, and the people who were interested in it, and the authority purchasing it, were neighbours and friends; and it was therefore thought very desirable, if possible, to avoid even the appearance of conflict. He and his learned friend Mr. Ram had therefore both advised their clients to stretch a point and give way a little. As the result of further negotiations, they had been able to come to terms; and he therefore asked the Arbitrators to make an award on the following basis: The price to be paid for the undertaking to be £14,000; the purchasers in addition agreeing to discharge a mortgage of £1000 and pay £100 towards the expense of winding up the Company—the latter sum, of course, having nothing to do with the costs of the arbitration, which would have to be dealt with in the ordinary way. He expressed the hope that the result would be satisfactory to everybody, and that in future the District Council would be very pleased with the undertaking they had bought. Mr. Ram confirmed the statement made by Mr. Freeman, and said he hoped that by the arrangement come to the Council would find that they had got a satisfactory undertaking at a price which the Company would regard as adequate. The Arbitrators then formally agreed to make the award in the terms mentioned.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This year's meeting of the North British Association of Gas Managers was held in Edinburgh last week. When either Edinburgh or Glasgow is the meeting place, there is sure to be a good attendance. It was particularly good on this occasion; and in addition to gratification at the numbers present, there was the added pleasure of seeing from how wide an area the assemblage was drawn. It was truly the gathering of a national assembly. Not only was every one of the large towns represented—which does not happen every year—but the representatives of the smaller towns who were present were from far as well as near. Of those who most regularly attend the meetings of the Association there was scarcely an abstention of any note. This, probably unconsciously, gave the "happy family" air to the meeting at its start—a characteristic which it bore throughout. In the House of Commons the member who says least of all is he who is designated the Speaker. Few Chairmen of meetings are able to rise to the ideal of the House of Commons. Mr. W. Ewing, of Hamilton, as President of this year's meeting, in this respect came as near to what should be as possible. He left the members to do the speaking—and there was no lack of it. The President's Address was a little disappointing; his explanation being that he had but recently recovered from an attack of the weakening ailment influenza. But apart from this, it is not given to everyone to be both a worker and an orator. Mr. Ewing has the better part of being able to produce good working results, which is certainly, for him, preferable to being able to lecture like a Lewes.

The two papers by Mr. Herring and Mr. Young were sufficient to make the meeting a memorable one. Mr. Herring had the good fortune to be able to deal with a subject which is new to the Association. Till he came to Scotland, there was no thought anywhere of erecting inclined retorts. By his paper, he has given managers in Scotland something to think of in relation to a process which is one of the prime factors in labour saving; and by his example, he is giving an earnest of his faith in the process. The reply which he made to the criticisms offered upon his proposed scheme, was a performance which was the talk of the members during the remainder of the meeting. Not only did the evident grasp of detail shine out in every sentence, but it was impossible to listen to his explanations without feeling that there was no side of the subject, and no possible source of failure, to which he had not applied his thoughts. It may be said that in the works he has devised for the Edinburgh and Leith Gas Commissioners there is not a brick more than is necessary, and that there is not a bolt or rivet in the plant which has not a special purpose, or which could be safely dispensed with. After receiving such a favour from Mr. Herring as this masterly communication was, the Association did what they could to mark their high sense of it in electing him President for the year. There are some who wonder how, in a year when he will be so busy, he should be able to find time to discharge presidential duties; but Mr. Herring, I venture to say, will feel them no burden upon him. Next year's meeting is to be held in Glasgow; and it is a fortunate thing for the Association that they will have a strong President—one who will give distinction to a meeting which is certain to have more than the customary attention paid to it.

Mr. Young, unfortunately, was unable to be present. His health is not so good as it was. It is fortunate, however, for all who are connected with gas supply, that he is able to wield his pen for their enlightenment. His paper was held as read, and will in this way be brought before the class of persons who are interested in it. There was a talk of its being discussed next year. This should be abandoned. Before then some of the conclusions in the paper may be out of date. Mr. Young has, before now, conducted some most interesting discussions through the medium of the "JOURNAL;" and this paper might well be dealt with in that way. The paper is entitled "Jottings:" it might almost be called "A Treatise upon Gas Production." I have only been able to glance through it; but, so far as I can perceive, it is an exceedingly broad-minded production,

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 272.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p. c.	18—19	..	5 10 6	60,000	5	Feb. 23	7	Ottoman, Ltd. . . .	5—5½	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	13—14	..	5 7 2	500,000	100	June 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101—103	..	4 17 1								
200,000	5	May 16	6	Bombay, Ltd. . . .	6—6½	..	4 12 4	851,070	10	Apl. 27	7	River Plate Ord. . . .	10—10½	..	6 13 4
40,000	5	,,	6	Do. New, £4 paid .	4—4½	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
880,000	Stk.	Feb. 23	12	Brentford Consolidated	250—260	..	4 12 4	250,000	10	Apl. 11	8	San Paulo, Ltd. . . .	11½—12½	..	6 8 0
270,000	,,	,,	9	Do. New . . .	182—187	..	4 16 3	135,000	Stk.	Mar. 14	10	Sheffield A.	244—247	..	4 1 0
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0	209,053	,,	,,	10	Do. B.	244—246	..	4 1 4
159,375	,,	June 14	4	Do. 4 p. c. Deb. .	116—120	..	3 6 8	447,427	,,	,,	10	Do. C.	244—246	..	4 1 4
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig. .	225—235	..	4 17 10	5,600,000	Stk.	Feb. 23	5½	South Metrop., 4 p.c. Ord.	126—129	..	4 2 7
296,320	,,	,,	8½	Do. A. Ord. Stk. .	160—165	—5.	5 3 0	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . .	94—97	—1	3 1 10
999,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11	380,940	Stk.	May 16	5	Southampton Ord. . . .	115—120	..	4 3 4
420,000	20	Mar. 29	10	British	39—41	..	4 17 7	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c. .	24—26	..	4 12 4	120,000	Stk.	Mar. 14	6	Tottenham A. 5 p.c. and B. 3½ p.c.	103—108	..	5 11 1
79,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8	250,520	,,	,,	4½		80—85	—5	5 5 11
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	8⅞—9½	..	6 9 9	55,100	,,	June 14	4	Edmonton 4 p. c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	99—101	..	3 19 3	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13¾—14½	..	5 10 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55—57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock .	270—280	—5	4 16 5								
286,425	,,	,,	10½	Do. New do. .	205—215	..	4 17 8								
288,237	,,	June 14	4½	Do. 4½ p. c. Deb. .	133—138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	153—158	—2	5 13 11					WATER COMPANIES.			
200,000	,,	,,	7	Do. 7 p. c. Pref. .	170—175	..	4 0 0	780,404	Stk.	June 28	11	Chelsea, Ord.	285—295	—10½	3 14 7
51,600	Stk.	Feb. 23	14	Croydon A 10 p. c. . .	335—340	..	4 2 4	150,000	,,	,,	5	Do. 5 p. c. Pref. .	155—160	..	3 2 6
178,400	,,	,,	11	Do. B 7 p. c. . .	265—270	..	4 1 5	160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	143—148	..	3 0 10
555,000	Stk.	Feb. 23	6½	Crystal Palace Ord. 5 p.c.	110—115	—3	4 11 4	175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130—135	..	3 14 1	1,720,560	Stk.	Apl. 11	7	East London, Ord. . .	187—192	..	3 12 11
486,090	10	July 27	11	European, Ltd. . . .	19—20*	..	5 10 0	854,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	142—147	..	3 1 3
854,060	10	,,	11	Do. £7 10s. paid .	14—15*	..	5 10 0	890,000	,,	,,	3	Do. 3 p. c. Deb. .	96—98	..	3 1 3
14,993,075	Stk.	Feb. 9	4 1/16†	Gas- 4 p. c. Ord. . .	97—99	..	4 8 10	700,000	50	June 14	7½	Grand 10 p.c. max. .	104—107	..	3 10 1
2,600,000	,,	,,	3½	light 3½ p. c. max.	95—97	..	3 12 2	810,000	Stk.	Mar. 29	4	Junction 4 p. c. Deb. .	130—135	..	2 19 3
3,799,735	,,	,,	4	and 4 p. c. Con. Pref.	117—119	..	3 7 3	708,000	Stk.	Feb. 23	14	Kent	307—312	..	4 9 9
3,993,975	,,	June 14	3	Coke 3 p. c. Con. Deb.	95—98	..	3 1 3	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	13¾—14½	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	275—285	—7½	3 18 8
2,800,000	Stk.	May 16	10	Imperial Continental .	197—202	..	4 19 0	406,200	100	,,	8	Do. 7½ p. c. max. .	203—208	..	3 16 11
473,600	Stk.	Feb. 9	8½	Do. 8½ p. c. Deb. Red,	100—103	..	3 8 0	850,006	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .	130—133	..	3 0 2
75,000	5	June 14	6	Malta & Medn., Ltd. .	4½—5	..	6 0 0	500,000	100	Feb. 23	13½	New River, New Shares	415—420	—5	3 4 3
560,000	100	Apl. 2	5	Met. of 5 p. c. Deb.	107—110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133*	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	106—108	..	4 3 4	902,300	Stk.	June 14	7½	South- Ord. . . .	193—198	—2	3 15 9
541,920	20	May 31	8½	Monte Video, Ltd. . .	10½—11½	..	6 1 8	126,500	100	,,	7½	wark 7½ p.c. max. .	182—187	..	4 0 3
667,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.	215—220	..	4 4 1	489,200	Stk.	,,	5	and 5 p. c. Pref.	155—160	..	3 2 6
299,855	Stk.	June 28	8½	Do. 8½ p. c. Deb. .	104—107	..	3 5 5	1,019,585	,,	Apl. 11	4	Vauxhall 4 p. c. A Deb.	129—134	..	2 19 9
150,000	5	May 16	8	Oriental, Ltd. . . .	7½—7¾	..	5 8 3	1,155,066	Stk.	June 14	10	West Middlesex . . .	270—275	..	3 12 9
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6¾	..	5 6 8	300,000	,,	,,	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅝	..	4 11 5	200,000	,,	Mar. 14	8	Do. 8 p. c. Deb. .	99—101	..	2 19 5
					* Ex. div.								*Ex div.		

† Next dividend will be at this rate.

and is full of the reasons why certain things have been done in the process of development in gas manufacture, and why certain other things which have been tried have not been successful. The narrative of the use of a revolving retort at Addiewell will make most people open their eyes. It will, there is little doubt, be closely looked at; it may be severely criticized; but whatever its treatment, it will remain a notable contribution to the literature of the industry. The same may be said of the whole paper. If by reason of any other decision than that which the Association came to the paper had not been made public, the world of gas making would have been the poorer by the want of it.

The other two papers—those by Mr. T. Lighbody, of Renfrew, and Mr. Forbes Waddell, of Forfar—were of much minor importance; but both were suggestive. Mr. Waddell's, in particular, is an example of what can be done, at small cost, by a manager who is not pressed for time, in the evolution of theories and the perfecting of processes. By such means, Science in reality creeps on from point to point.

There was a welcome infusion of new blood in the speaking. On all grounds, indeed, the Association may congratulate themselves upon the success of this year's meeting, and upon the good prospects for the future. These were seldom brighter than they are at present.

There will be a disposition generally to congratulate Mr. A. Waddell upon his transfer from Broughty Ferry to Dunfermline He leaves a 44 for a 77 million cubic feet gas-works. This is his third position as Manager. In the two former places he was successful in greatly reducing the price of the gas. Mr. Waddell is a man of resource, quick to adopt whatever may help him in his work. He may be relied upon to make his individuality felt in Dunfermline. There are two elements he will have to reckon with. He will be much nearer the coalfields, and should get his coal cheaper than at Broughty Ferry. This will be an advantage. There is, on the other side, the consideration that he is going to a works in which, while the output is not twice what it is in Broughty Ferry, the capital is three times as great, and the rate of interest is from 3 to 4 per cent., as compared with 2¾ per cent. upon the capital in Broughty Ferry. What the Dunfermline undertaking requires to be done for it, in the first place, is a reduction of its capital liabilities.

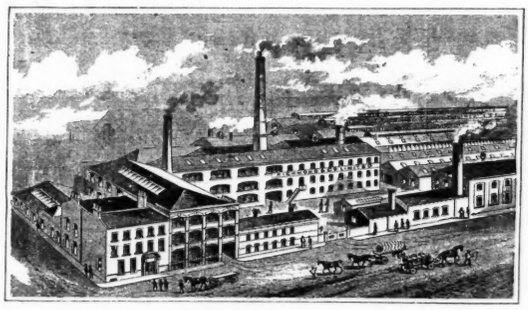
Mr. W. M'Crae, the Engineer and Manager to the Dundee Corporation Gas Department, has recommended the Police Committee of the Town Council, who have charge of the public lighting of the city, to erect 100 lanterns for incandescent gas lighting, at a cost of £2 3s. 2d each. He estimates that the annual charge for mantles would be about 5s. per lamp. The lamps would each consume 3 cubic feet of gas per hour, and would replace ones which consume 2 cubic feet per hour. The cost of gas would thus be 1s. 10l. per lamp per annum more than at present; but the illumination would be greatly superior. The Committee agreed to recommend the adoption of the proposal.

On Wednesday night, an explosion of gas, of some magnitude, occurred at the corner of Balmano Brae and Tarbet Street, Glasgow. The inhabitants of the district had complained of a smell of gas; and workmen from the Gas Department were searching for the leakage upon the surface of the ground, by means of a lighted torch, when the explosion occurred. Part of the pavement was dislodged, and a girl was thrown down, though fortunately without injury. Several persons complained of suffering from shock; but a medical man who visited them could not discover anyone injured. The gas had accumulated in a built drain.

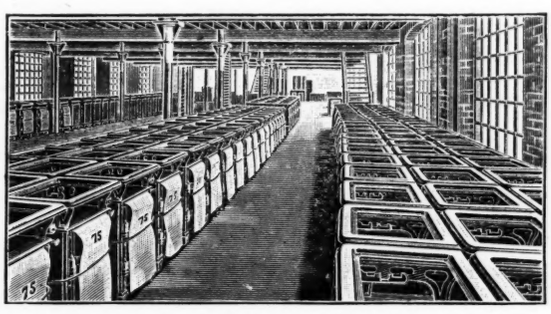
The Kirkcudbright Gas Commission have had an unfortunate year. They estimated for a revenue of £1032, but only realized £970. Their expenditure was estimated at £707, and it amounted to £746. The balance to be carried to profit and loss account was estimated at £328, and it amounted to only £223. There was a charge against the latter sum, for interest, &c., of £301, which left a deficit on the year's working of £78. Bailie Hogg, in submitting the accounts at a recent meeting, said they were sadly deficient in the amount of gas obtained per ton of coal. He suggested that a new retort-bench be put up, which would likely cost from £400 to £500. They would probably by this means save 10d. per 1000 cubic feet of gas. After some discussion, the Commissioners agreed to hear Mr. W. W. M'Dougall, the Manager, as to what should be done. Mr. M'Dougall said that they required a new retort-house, with Hislop's patent settings of retorts, new purifiers, and increased gasholder accommodation. At present they had only storage for 15,000 cubic feet of gas; and their maximum consumption per 24 hours was 22,000 cubic feet. It was agreed to consult Mr. G. Malam, of Dumfries, on the subject; and a Committee were appointed to consider his report.

At the annual meeting on Tuesday of the recently incorporated Carluke Gas Company, Limited, it was reported that the quantity of gas sold during the past year was 10,718,300 cubic feet; an increase of 1,613,200 cubic feet over the previous year. The revenue was £2518, or an increase of £645. The profit was £834. A dividend at the rate of 7 per cent. was paid for the year, and a balance of £484 was carried forward. The Directors expect to be able to retain the price of gas at 3s. 9d. per 1000 cubic feet.

The Directors of the Kelso Gas Company met last Tuesday, and finally passed estimates for the building of a new coal-store at a cost of about £350. At the same meeting the arrangements were completed for the purchase of 2½ acres of ground adjoining the works for the purpose of extensions—a new holder and new purifiers being immediately contemplated. The consumption of gas has increased greatly of late years —from 12 million cubic feet in 1892 to 17½ millions now. There are in use 70 slot meters and 280 gas cookers, grills, fires, &c. Upwards of 70 tons of new mains were laid to the town during last summer; and the carbonizing plant (regenerative furnaces) was largely increased. The Company are gradually improving the public lighting, and have now 50 No. 4 Kern 100-candle lamps in the streets, out of a total of 160 lamps in all; and it is hoped soon to have all these fitted with Kern burners. The lighting and upkeep are entirely under the control of the Manager (Mr. A. C. Young); and the Company supply No. 4 Kern burners and mantles, and do the lighting, repairs, &c., for 34s. per lamp per annum. The price of gas has been increased by 5d. per 1000 cubic feet, while the extra cost of coal means an additional expenditure equal to 1s. per 1000 cubic feet. The Directors were confident that but for the higher cost of coal (8s. per ton over all) they would have been able to reduce the price by 5d. rather than increase it. In view of the large number of cookers and incandescent lamps and gas-engines now in use, they are of opinion that



WARRINGTON WORKS.



STRATFORD WAREHOUSE, No. 1.

"Noble stock, I'd wish no better choice."—Pericles V., 1.

THROUGH INCREASED PRODUCTION, WE CAN SHOW YOU 4245 "MODEL" COOKERS IN STOCK. WHY WAIT FOR OTHERS? WIRE US.

GAS APPARATUS..LONDON
STOVES.....WARRINGTON
OGEN.....LONDON

"Fetch forth the stocks, ho!"—Lear II., 2.

the time is ripe for a reduction in the illuminating power of the gas, which is 26 candles. Mr. Young has not been quite three years with the Company; and the Directors have shown their appreciation of his services by twice raising his salary—first by £30 and afterwards by £20 per annum.

The Glasgow Gas Committee are looking forward to the time when more gas will be required in Pollokshaws, Shawlands, Langside, Battlefield, Cathcart, and the adjacent districts, as they have recently secured a plot of ground on the banks of the Cart and within the township of the "Shaws," partly in exchange for the site of the old Pollokshaws Gas-Works, which were closed some time ago, after being worked for two or three years in the interest of the Glasgow Corporation. The ground thus acquired will eventually be utilized for the construction of a tank and the erection within it of a big gasholder, having a capacity of some 5 or 6 million cubic feet, which has now become quite the fashion with the Glasgow Gas Committee, or their Engineer (Mr. W. Foulis).

The accounts of the Electricity Department of the Corporation of Glasgow for the past year show a revenue of £59,762, of which £55,471 was derived from the sale of current per meter and £4291 from the Corporation for street lighting. In the preceding year, the respective sums were £41,639 and £2502. For the past year, the expenditure was £38,181, as compared with £31,534. A balance of £21,581 remains to be carried to profit and loss account. The borrowing powers sanctioned by the Secretary for Scotland amount to £700,000; and £628,500 has been raised at 3¼ per cent. Of this amount, £11,500 has been repaid, leaving borrowing powers to be executed to the amount of £60,000. The total amount of electricity generated last year was 3,401,731 Board of Trade units, against 2,619,019 units the previous year. The amount supplied to private consumers was 2,566,016 units, as against 1,885,902 units, or an increase of 680,114 units; while for public lamps the quantity supplied last year was 258,334 units, showing an increase of 30,200 units.

New Reservoir at the Bognor Water-Works.—The opening of a new reservoir in connection with the Bognor Water-Works took place last Tuesday. It is situated close to the Company's pumping-station, is capable of holding 500,000 gallons of water, and is fed from a source which, while being of the greatest purity, is believed to be practically inexhaustible. The reservoir is lined throughout with portland cement, and the concrete walls are 5 feet thick. The length is 100 feet; the width, 72 feet; and it will hold water to a depth of 12 ft. 3 in. There are four roofs of brick arches, 16½ feet span, supported internally by 33 brick columns, with 30 semicircular arches of 7 feet span. From the pumping-station the water passes through a 12-inch supply pipe, and there is a 12 inch wash-out pipe, with overflow connected. The reservoir is covered with a 15-inch layer of soil, which, with the slopes of the earthen embankment, will be sown with grass. The level of the water in the new reservoir is nearly 30 feet higher than that in the old tank in the town, which has done duty for the Company in the past. The works have been carried out by Messrs. T. Docwra and Sons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 28.

Sulphate of Ammonia.—There has again been a fairly active inquiry, and for prompt or near delivery a good amount of business has been put through at last week's prices; but the buying has not been keen enough to cause a further improvement in values. For prompt delivery, £11 5s. per ton f.o.b. Leith is still quoted; and at Hull and Liverpool, values remain at £11 to £11 2s. 6d. London quotations are £11 to £11 2s. 6d., ordinary terms; but supplies at that port are somewhat limited. For forward delivery, no fresh business is reported; but for delivery up to the end of the year, quotations are steady at £11 to £11 2s. 6d. per ton, Beckton terms, according to position, and at £11 10s. f.o.b. Leith for October-March delivery.

Nitrate of Soda is dearer. Spot quotations are 8s. 1½d. per cwt. for ordinary, and 8s. 4¹d. for refined quality. For shipment, 8s. 6d. has been paid, and about 1½d. per cwt. advance is now asked.

LONDON, *July* 28.

Tar Products.—The remarkable slackening off in the demand for creosote, and the equally marked drop in prices, has caused great uneasiness among manufacturers, and is reflecting itself decidedly on the value of tar, which is quoted lower. Some of the large tar distillers declare they cannot pay anything like to-day's quotations for tar, if they are to see their own money again. Benzols are moderately steady, with a fair amount of business being done. Carbolic acid is firm. Naphthalene and salts are not quite so strong; while common naphthas are somewhat unsaleable. There is no change in the position of anthracene. The market is fairly firm, as at the present prices makers have little interest in producing it. Pitch is being freely sold for next season's shipment; and the general forecast is that prices will be maintained, though at the moment both prompt and forward quotations are lower.

The average prices of the week are: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 7½d. to 8¼d., according to position; special qualities for gas, 9½d.; 50's, 10½d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 45s. to 75s. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—This market is a little easier, and dealers are evidently casting round in the hope of covering their requirements at a shade below to-day's values. There has been a decided falling off in buying during the week; but the position is known to be strong, and the material is required. There is, therefore, no occasion for any anxiety, especially as the make is at its minimum and stocks are small. About £11 2s. 6d. per ton, less 3½ per cent., is the average value at all ports.

The Directors of the Gas, Water, and General Investment Trust, Limited, have declared interim dividends at the rate of 4½ per cent. per annum on the preferred stock, and 2 per cent. per annum on the deferred stock for the past half year; carrying forward a balance of about £9000.

C. & W. WALKER, LTD.,

Midland Iron-Works, Donnington, nr. Newport, Shropshire.

110, CANNON STREET, LONDON, E.C.

Telegraphic Addresses: "FORTRESS, DONNINGTON, SALOP." "FORTRESS, LONDON."
Codes used A.B.C. and "A1."
Telephone No. 12, WELLINGTON, SALOP.

GASHOLDERS WITH OR WITHOUT STEEL STANDARDS AND TANKS.

PURIFIERS IN CAST IRON OR STEEL.

PURIFYING-MACHINES FOR AMMONIA. SCRUBBERS.
TAR-EXTRACTORS. RETORT MOUTHPIECES OF ANY SHAPE.

WECK'S PATENT CENTRE-VALVES.

CONDENSERS. CRIPPS'S GRID-VALVE TAR-BURNERS.

SIEVES. For bye-passing the lower layer in Purifiers. VALVES.

TYSOE'S SELF-SEALING MOUTHPIECES.

Tar-Distilling Plants. Claus' Sulphur-Recovery Plants.

SULPHATE OF AMMONIA PLANTS.

COAL TRADE REPORTS.

From Our Own Correspondents.

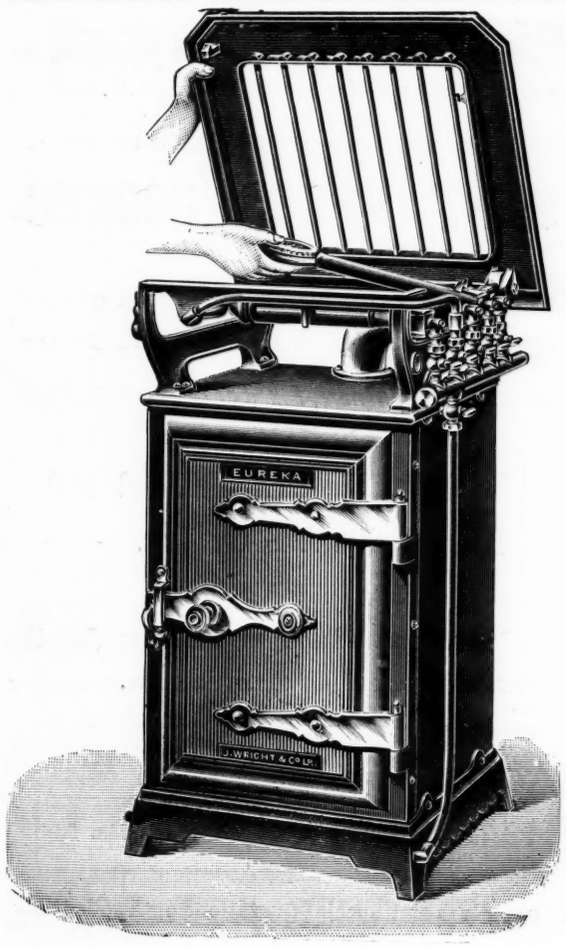
Lancashire Coal Trade.—The anticipations of an upward move in prices with the close of next month, to which reference was made in our last week's report, have brought forward quite a pressure of orders, especially for the better qualities of round coal; and, in fact, so much eagerness is just now being shown by consumers of house-fire coals to get in to a large extent their winter supplies, that there is some danger this may force on an advance in prices earlier than the coalowners had generally intended. During the past week, the business coming forward in the better qualities of round coal has not only been considerably in excess of the output, necessitating in many cases the filling up of small stocks that had previously been accumulated, but coalowners are already getting in arrear with their orders, and probably at no previous similar season of the year has there been so large a trade doing in house-fire qualities. This exceptional pressure for domestic purposes is necessarily withdrawing from the market the large quantities of the lower qualities of round coal which are usually being offered at this time of the year in surplus lots for steam and forge purposes, so that all classes of fuel are more or less affected. For the present, there is no further change in prices beyond perhaps a hardening up on the low quotations for steam and forge coals which have been under the contract rates; and at the pit mouth the average prices may be quoted from 12s. 6d. to 13s. per ton for the lower qualities of round coal, 13s. to 13s. 6d. for common house coal, 14s. to 14s. 6d. for seconds, such as Pemberton four feet and lower classes of Arley, up to 15s. to 15s. 6d. for the better descriptions of Arley. This exceptional briskness in the round coal trade is causing a correspondingly larger output of slack, and supplies of engine fuel are becoming increasingly plentiful on the market; while the demand for mill purposes shows a tendency to decrease, owing to the unsatisfactory outlook in the cotton trade. Lancashire collieries are at length beginning to feel this altered condition of the market; and in many cases slack is accumulating, while surplus supplies from outside districts are perhaps being pushed more keenly than ever at much below local quotations. The whole tendency is decidedly in the direction of weakness, so far as engine fuel is concerned; and although Lancashire collieries are still holding to late rates, on the basis of 10s. 6d. per ton as the minimum for common up to 11s. and 11s. 6d. for the best qualities of slack at the pit-mouth, they are finding orders difficult to get at these figures, in the face of outside competition, and it is becoming a question how long they may be able to maintain prices on their present basis. For shipment, the demand continues generally active, although not of such a pressing character as to give any hardening tendency to prices, which generally are not more than maintained at the recognized Association basis rates of about 15s. 3d. per ton for ordinary screened steam coal, delivered at Mersey ports. For coke, the demand is being fully maintained, and the position as regards prices is exceedingly strong, the tendency being, if anything, towards a further hardening on current rates on new business coming forward; but quotations generally at the ovens remain at about 24s. to 24s. 6d. per ton for furnace, to 31s. to 32s. for best foundry classes of coke.

Northern Coal Trade.—Now that the strike at Rotterdam has passed away, there is rather more activity in the coal trade; and with a better supply of steamers, the shipment of coal is proceeding more rapidly. In the steam coal trade, there is a steady demand; and with some pressure for early delivery for Russia, the price is firmer at from 18s. to 18s. 3d. per ton f.o.b. Steam smalls are still rather quiet, at from 11s. 6d. to 12s. per ton. In the gas coal trade, the demand is good for the season; and the price is from 15s. 9d. to 16s. 9d. per ton f.o.b. for best Durham gas coals, for occasional sales. The bulk of the deliveries, however, continue to be on contracts, at prices which are now from 15s. 9d. to 16s. per ton. The miners of Durham are pressing for further advances in wages, which will probably in some degree have to be given, and which will to this extent add to the cost of the production of gas coals in that county. There is continued strength in the coke trade; best coke for export being 35s. per ton f.o.b.; while blast-furnace coke is about 29s. per ton at the Teesside blast-furnaces. In gas coke, there are, locally, higher prices for household supplies; about 11d. per cwt. being the quotation in Newcastle. For export, the price of gas coke varies much; and not until the production is fuller will a reliable medium price be obtainable.

Scotch Coal Trade.—There is still a small output from the collieries, which keeps prices up; but it has to be borne in mind that steel and iron works have not yet started work, which should have the effect of keeping rates down. The quotations for the little business which has been done are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 159,550 tons—a decrease of 38,079 tons upon the preceding week, but an increase of 7351 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,829,928 tons—an increase of 1,101,345 tons upon the same period of last year.

The West Cumberland Water Scheme.—The Egremont Urban District Council last Tuesday rejected the proposals of the Whitehaven Rural District Council for the supply of water to the latter's district, which includes Seascales and parishes in the southern district. It had been intended that the Egremont Council should promote a Bill in Parliament for a supply from Wormghyll, and that the Whitehaven Rural District should become customers.

Gas Profits at Todmorden.—At the last monthly meeting of the Todmorden Town Council, Alderman William Jackson, the Chairman of the Gas Committee, reported on the gas undertaking for the year ended March 21. The total income, he said, was £24,939; and the gross expenditure, £15,399—leaving a gross profit of £9539, equal to 6·7 per cent., and, after paying interest, &c., a net profit of £3002, as compared with £1476 last year. The net profit had been considerably reduced by an account of upwards of £600 for work done previous to this year, as well as by an increased cost of about £500 for coal. Since the Local Authority purchased the works, about 6¼ years ago, they had made a profit, after meeting all charges against the undertaking, of £14,574.



LATEST DEVELOPMENT
IN
GAS-COOKERS

WRIGHT'S PATENT,
BY WHICH ALL THE
ADVANTAGES OF LOOSE BURNERS
ARE OBTAINED
WITHOUT
ANY OF THE DISADVANTAGES.

NO EXTRA CHARGE IS MADE
FOR THESE IMPROVEMENTS.

JOHN WRIGHT & CO.
LIMITED,
LONDON & BIRMINGHAM.

Burry Port Water Supply.—General Crozier some time ago held an inquiry at Burry Port on the application of the Llanelly Rural District Council for sanction to borrow £22,400 for purposes of water supply. At last Thursday's meeting of the District Council, a communication was read from the Local Government Board stating that the scheme was open to objection on the grounds that in the agreement made with Mr. Mansel Lewis the latter would be able to take more than half the total estimated yield of the gathering area, and even more if necessary. Further, the Council did not propose to purchase the underlying coal; and thus laid themselves open to risk of dangerous subsidences. Special measures would be necessary also to deal with the drainage of farms, so as to prevent pollution. The Board therefore asked the Council to reconsider the scheme with the view of meeting the above objections. It was remarked that the Local Government Board approved of the sewerage scheme; but it would be no good without the water one. It was decided to refer the matter to Messrs. Beasley, the Engineers.

Seville Water-Works Company, Limited.—The annual meeting of this Company was held last Friday, under the presidency of Mr. David Evans. The report showed that the income for the year ended March 31 last was £30,989. The net profit was £8195, as compared with £8681 in the previous year. To this sum was added the unappropriated profit at March 31, 1899—namely, £11,844; and after charging the contribution to the sinking fund of £783, and transferring £10,000 to capital account as a provision for expenditure on works in excess of capital raised, the amount standing to the credit of profit and loss account was £9256, which the Directors recommended should be carried forward. The expenditure on capital account so far incurred in excess of capital raised, and the further commitments which the obligations of the concession cast upon the Company, rendered it impossible for the Board to propose the payment of a dividend. The Chairman, in moving the adoption of the report, said that, after having read the Directors' and the Manager's reports, it might be a matter of surprise to the shareholders that, with a net profit of £8195, no dividend was recommended. In order to pay a dividend, however, they would have had to borrow the money; and at the present rate of exchange, this was a very serious matter. The money that the Company ought to have in hand wherewith to pay a dividend was owing to them by the Municipality of Seville. They had no reason to doubt that the Municipality would eventually pay their debts; but in the meantime promissory notes were not cash. The aim of the Board was to keep down the capital account. They could only raise additional capital by offering preferential terms; and the more the preferential shareholders absorbed, the less there was for the holders of ordinary shares. The Company had had a run of ill-luck. They not only had to face a heavy loss on exchange, but there had been a drought which had lasted for three years. The Board had for the last nine months been in negotiation with the town for the settlement of all outstanding differences; and they hoped the result would be satisfactory to both parties. The Company was not a non-dividend earning one; the Directors merely deemed it wise not to distribute the dividend, but to place the amount to capital account. The report was adopted.

The Falmouth Corporation and the Water-Works.—It was decided by the Falmouth Corporation last Wednesday to instruct Mr. Phillips to report on the water-works and the advisability of municipal purchase. Mr. J. W. Buckley, who moved the resolution, said they wanted an unbiassed estimate of the value of the undertaking.

North Warwickshire Water Bill.—At the meeting of the Solihull Guardians last Tuesday, a letter was read from Mr. A. Bassett Hopkins, of the Temple, stating that now that the North Warwickshire Water Bill had practically passed, he could not deny himself the pleasure of congratulating the Solihull District Council and the Chairman of the Guardians upon the protective provisions in relation to purchase, &c., of which they had procured the insertion. A distinct service had, he said, not only been done to the inhabitants of the district, but to local authorities and the public in general, in relation to water supply. The ten years' purchase clause was the shortest period for optional purchase ever obtained by a public authority in a company's Water Bill. It was a new precedent, and was the more acceptable from the fact that it was obtained in the face of strenuous opposition.

Otley Water Scheme.—At a recent special meeting of the Otley District Council, Mr. T. A. Duncan, Chairman of the Water Committee, gave a *résumé* of the agreements which had been entered into by the Council in connection with their new water scheme, the Bill for which has recently received the Royal Assent. The scheme is to impound the waters of March Gill and Bow Beck, two tributaries on the north side of the Wharfe, in the township of Middelton, near Ilkley. After giving a brief outline of the work done by the Council when the scheme was first commenced, and emphasizing the necessity for obtaining an augmented supply, Mr. Duncan said the first agreement he would mention was with the Ilkley Urban District Council, who had met them most fairly in the matter. The Council claimed to have the right to supply three townships within the area—Middelton, Nessfield-with-Langbar, and Denton. The Otley Council had, therefore, agreed not to supply these townships, or any individual or authority in them, with the exception of the Ilkley Council, whom they would supply in bulk at 6d. per 1000 gallons, restricting the supply to 50,000 gallons per day. The next agreement was with Mr. Middelton himself, and was for the protection of the Middelton Estate. They had agreed to serve him upon the same conditions as the Ilkley Council, although it was not likely that they would ever be called upon to supply such a quantity. The price of the land (30 acres) and the easements had been fixed at £6000. No land was required from Mr. M. D. Wyvill, M.P.; but the pipes would be brought through his land a considerable distance, and the question of price was to be settled by arbitration. The Council also agreed to supply Mr. Wyvill with 10,000 gallons per day at 6d. per 1000 gallons. The Leeds Corporation, who had rights in the parish of Denton, had agreed to accept £250 in settlement of their claims; and the Wharfe millowners were to have a guaranteed supply of 140,000 gallons of water daily, and receive £120 compensation. The agreement with Mr. John Waugh, the Engineer for the works, was that he was to receive 6½ per cent. on the contract price; or if the Council carry out the works themselves, 6½ per cent. on the cost.

R. & A. MAIN, Ltd.

214, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

EDMONTON: GOTHIC WORKS. | BRISTOL: 28, BATH STREET. | MANCHESTER: 37, BLACKFRIARS STREET. | GLASGOW: ARGYLE WORKS KINNING PARK. | FALKIRK: GOTHIC IRON-WORKS.

THE NEW "MAIN" PREPAYMENT METER COOKER.

Embodies all the latest and most perfect developments in GAS COOKING-STOVES.

Hot-Plate and Oven Burners, Fixed or Removable at will.

FITTED COMPLETE WITH GRILLING AND BOILING BURNERS ON TOP.

Enamelled Door Plate and Loose White Enamelled Crown, extra.

Nos.	1211	1212	1213	1214
List Prices	45s. 0d.	47s. 6d.	52s. 6d.	56s. 6d.

Full Particulars and Special Quotations on Application.

Some of the Costs of the Derwent Valley Water Scheme.—A meeting of the Derwent Valley Water Board was held at Derby, last Thursday, Alderman Gainsford presiding. The following bills of costs as allowed by the Taxing Master of the House of Commons were presented to the Board and ordered to be paid: Corporation of Derby, £28,120; Corporation of Leicester, £31,274; Corporation of Nottingham, £4729; Few and Co., £3454; and R. W. Cooper and Sons, £83. The Board subsequently resolved to obtain scientific geological advice with regard to the geology of the Derwent Valley. The promotion and passing of the Bill involved an outlay of about £100,000.

Unreasonable Use of Water by Leeds Publicans.—We learn from the "Leeds Mercury" that a rather novel discovery has just been made by an official in the service of the Water Committee of the Leeds Corporation. The Committee have had to ask the public to be careful not to waste water, having regard to the effect of the recent dry and hot weather on the quantity in the reservoirs. But, notwithstanding this, the Committee were puzzled to find that there was still an extraordinary leakage, and instructions were given to the inspectors to thoroughly investigate the matter. They did so, but nothing came of it. The Committee were naturally not satisfied with this, and they consequently appointed an inspector specially to make inquiries afresh. The result of his efforts revealed the fact that a number of publicans in the city, in order to keep their cellars cool and the beer in condition, had found it necessary to turn on the water-tap and keep the water running for an exceptionally long period. As the water thus used does not pass through any meter, it was being had on fairly easy terms. So far as the inquiries have gone, it appears that the practice commended itself to one out of every seven publicans whose premises were visited. The quantity of water consumed in this way is estimated at an average of a million gallons daily. A special meeting of the Committee, for the purpose of taking the matter into consideration, was held on Monday last week, at the Town Hall, Alderman Cooke (Chairman) presiding. It was decided to take the necessary steps to render similar misuse of water unlikely in the future; but nothing transpired with regard to what action should be adopted with reference to the offenders.

Messrs. Beesley, Son, and Nichols, of Westminster, have been awarded the first premium in the competition for works for the supply of Honiton with water.

It is proposed to borrow £6000 for the extension of the Kidderminster Water-Works. The Corporation have authorized the engagement of an expert to prepare the plans and to superintend the works.

Messrs. John Wright and Co. recently held, under the auspices of the Ashton Gas Company, in the Oddfellows' Hall, Ashton, an exhibition of their "Eureka" and other gas-stoves; Miss M. B. Terrace giving demonstrations in cookery.

During the past three weeks, Messrs. R. & A. Main, Limited, have held highly successful exhibitions in the New Assembly Rooms and Grand Assembly Rooms in Newcastle-on-Tyne, as well as in the Co-operative Hall, Gateshead.

The excavations taking place in Newcastle-on-Tyne, in connection with the improvement of the tramway system, have resulted in the disclosure of one of the old wooden water-pipes. It appeared to be of Scotch fir, and had a bore of about 3 inches.

The New Conveyor Company, Limited, of Smethwick, are sending out a pamphlet and price list of their detachable chains and sprocket wheels, serviceable for transmitting either power or materials. In addition to the prices, the approximate horse powers which the chains will safely carry are given.

The net result of the trading in the year ending March 31 last by the Coventry Gas-Fitting, Electrical, and Engineering Company was a loss of £948, more than half of which was due to a bad debt contracted in 1898. This loss, together with the adverse balance from the year 1898-9, has been deducted from the reserve, which now stands at £1172.

Extraordinary general meetings of Messrs. John Wright and Co., Limited, and the Eagle Range and Gas-Stove Company, Limited, were held in Birmingham last Thursday, at which the resolutions passed at previous meetings to sanction the amalgamation of the two undertakings (see *ante*, p. 181) were confirmed. The title of the new Company will be John Wright and Eagle Range, Limited.

The amended tender has been accepted of Mr. H. Roberts, of Ashford, for the construction of a service reservoir, engine-house, mains, &c., for the supply of Faringdon with water, for £3990, in accordance with plans prepared by Mr. G. Winship, Assoc.M.Inst.C.E., of Abingdon. The oil-engines and deep-well pumps in duplicate will be supplied by Messrs. Hornsby and Sons, Limited, of Grantham, for £497.

The London agents for the Metropolitan Gas Company of Melbourne, Messrs. John Terry and Co., have received by cable particulars of the half-yearly meeting of the Company. The profits for the six months to the 30th of June were £51,000. A dividend of 4s. per share was declared; a sum of £15,000 was placed to the reserve fund; and a balance of £8500 carried forward. Dividends will be payable in Melbourne on the 6th prox.; and drafts will be posted to absentee shareholders by the first mail after that date.

On Saturday, the 21st inst., a party of the employees in the Gas and Electricity Fittings Department of the Bolton Corporation, accompanied by Alderman Miles, J.P., the Chairman of the Gas Committee, and other members and officials, had their annual outing; the place selected being Castleton. On reaching their destination, conveyances took the visitors to the celebrated Speedwell and Blue John mines, which were explored with much interest. After luncheon at "Ye Olde Cheshire Cheese" Hotel, the party drove to Hathersage and Surprise View, and then returned to the hotel to tea. An interesting feature of the subsequent proceedings was the presentation to Alderman Miles, on behalf of the fitters, of a handsome epergne, in wrought iron and copper work, in token of their respect, and as a memento of his visit with them to Castleton. Alderman Miles feelingly thanked the men for their beautiful and unexpected present, and assured them that he would treasure it as one of his most valued possessions.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000

BANK HOLIDAY.

NOTICE TO ADVERTISERS.—In consequence of the **BANK HOLIDAY** (Aug. 6), orders with respect to **ADVERTISEMENTS** should be received at the Office *not later* than **THE FIRST POST ON SATURDAY NEXT.**

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ, HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.

MELROSE CYCLE COMPANY, COVENTRY.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND CO., MIDDLESBROUGH.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Have-lock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

PORTER & CO., Gowts Bridge Works,
LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see July 3, p. 53.]

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited,
Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application.
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

SADLER & CO., Ltd., Middlesbrough,
Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

TRAVELLER, with old and extensive connection among Gas Companies, is open to REPRESENT a Firm of Fire-Clay Retort and Brick Manufacturers and General Gas Plant Contractors.
Address No. 3521, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Manager in Small Gas-Works (from 2 to 10 millions). Can undertake any branch of the work. Excellent References.
Address No. 3526, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SON of a Gas Manager (age 24) who has had good experience in all Branches of Gas-Works abroad desires a SITUATION. Can speak English, French, Italian, and Spanish.
Address No. 3527, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, experienced Retort Setters.
Apply to R. DEMPSTER AND SONS, LTD., ELLAND.

WANTED, at once, a steady, reliable Man as STOKER. Must be a good Shovel Charger, and used to Engine and Exhauster. Wages, £1 10s. per week of seven days, with a week's holiday every year.
Apply to S. BARK, Manager, Gas-Works, SUNBURY-ON-THAMES.

A GAS Company require the services of a smart intelligent young Man as SHOP ATTENDANT, to also take charge of a Gas and Electricity Fittings Department. A good knowledge of Electric Wiring indispensable.
Apply, stating full Particulars as to Qualifications, Experience, Age, and Salary required, to No. 3531, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LITTLEBOROUGH GAS COMPANY.

WANTED, a competent Meter In-spector. Must be able to repair Wet and Dry Gas-Meters.
Applications, stating Experience, Age, present Occupation, and Wages required, together with *copies* of two recent Testimonials, to be sent to the undersigned, not later than Aug. 6, 1900.
JOHN COCKCROFT,
Manager and Secretary.
Gas-Works, Littleborough,
near Manchester.

SOUTH SHIELDS GAS COMPANY.

WANTED, a thoroughly competent Gas ENGINEER to take the management of the Gas-Works. He must be well versed in the modern methods of Manufacture and Distribution of Gas and the Production of Sulphate of Ammonia; also capable of designing and carrying out extensions of Works and Plant.
There are two Stations, with a Superintendent at each.
The total annual make is about 540 millions.
Age not to exceed 40 years.
Applications, marked "Gas Engineer," stating Age, Experience, Qualifications, and Salary required, and enclosing *copies* of recent Testimonials, to be sent to the undersigned on or before the 9th day of August, 1900.
By order of the Board,
J. H. PENNEY,
Secretary.
Gas Offices, Chapter Row,
South Shields, July 27, 1900.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.
SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

WANTED, a steady Man as Stoker (shovel charging). Wages 27s. per week.
Apply, with Reference, to the MANAGER, Gas-Works, Kingston Road, Leatherhead, SURREY.

STOKERS wanted. Constant employ-ment to good, steady men used to shovel charging. Wages 31s. per week.
Apply, by letter, to No. 3532, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Irthlingborough Gas and Coke Company, Limited, a thoroughly qualified MANAGER and SECRETARY. Annual make of Gas about 15 Millions.
Applications, with *copies* of recent Testimonials, stating Age, Experience, and Salary required, to be sent to Mr. JOHN T. LEWIS, Gas-Works, WELLINGBOROUGH.

WANTED, an Ammonia Still. Vertical make, small size, with Heater and Saturator, &c., complete.
Address No. 3528, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Engine and Exhauster, 20,000 cubic feet per hour, in good condition, ready for immediate delivery.
BENJAMIN BARK.
Gas-Works, Godalming.

FOR SALE—An adjustable Screwing MACHINE. Solid Stock and Die. Cutter (three-wheel, large and small). Pipe Vices and Tongs, as new. High-class Tools.
Apply to G. W., 4, Mount Pleasant, SHREWSBURY.

ENGINES and Exhausters combined
"Waller," to pass 30,000 cubic feet per hour.
DITTO to pass 7000 feet per hour, overhauled and complete. Cheap to clear. Also BOILERS.
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GASHOLDER, 50 ft. by 20 ft., with Six Columns, 15 inches diameter, Wrought Lattice Girders, &c., complete and perfect. About Fourteen Years old.
Price, erected, on application to J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

FOR SALE—Two Lancashire Boilers, each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.
Apply to NEWTON, CHAMBERS, & CO., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

STOURBRIDGE Retorts for Sale, lying at a Gas-Works in Kent. New, first quality. 22 in. by 16 in. D's—viz., 30 Mouthpieces 6 ft. 9 in. open ends; Six 9 ft. 10 in. Mouthpieces open ends; and Ten Middles, 6 ft. 6 in. Manufacturer will make up quantity and lengths required. Offers solicited.
Apply, by letter, to No. 3530, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND PHOTOMETERS.

MESSRS. Alex. Wright & Co., Ltd., have several second-hand EVANS & LETHEBY PHOTOMETERS, complete with Instruments in thorough working order and good condition, which they can offer at greatly reduced Prices.
Write ALEX. WRIGHT AND CO., LIMITED, Precision Works, 81, Page Street, WESTMINSTER, S.W.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE above Board are prepared to re-ceive TENDERS for an OIL-TANK 23 feet diameter and 20 feet deep.
Plan and Specification can be seen on application to R. West, Manager, Gas-Works, Hebden Bridge.
Sealed and endorsed Tenders to be delivered at the Gas-Works by Wednesday, Aug. 9, 1900, addressed to E. J. Crossley, Esq., Chairman.
R. WEST,
Manager.
Hebden Bridge,
July 23, 1900.

IMPORTANT NOTICE.

ST. JAMES' HALL,

SEPTEMBER 10th, to SEPTEMBER 29th, 1900.

The Largest Permanent Exhibition Building in the United Kingdom (London excepted), **Ground Space without Machinery Hall 30,000 square feet.**

MANCHESTER.

GAS ✣ INDUSTRIAL ✣ EXHIBITION.

75 PER CENT. OF SPACE ALREADY BOOKED.

Applications in GAS COOKING and HEATING Section must be sent in before AUGUST 20th.

GAS ENGINES, August 29th.

GAS LIGHTING, August 29th.

GAS PLANT, August 29th.

PLANS OF SPACES TAKEN CAN BE HAD FROM ST. JAMES' HALL, MANCHESTER.

THE

GAS INDUSTRIAL EXHIBITION.

FOLLOWING on the very successful termination of the late Gas and Allied Trades' Exhibition in London, arrangements have been made to hold a similar one in Manchester, for which purpose the well-known

ST. JAMES' HALL

has been secured

(**The Largest Permanent Exhibition Building in the United Kingdom,** London excepted, **Ground Space without Machinery Hall 30,000 square feet**).

The Exhibition will constitute the most important exposition of

GAS COOKING.

GAS HEATING.

GENERAL ILLUMINATING.

held since the Invention Exhibition, sixteen years ago.

It is the intention of the organisers of these present century Exhibitions to bring into comparative juxtaposition all the greatest developments and revolutionary changes relative to the Manufacture of Gas, and also the application devoted to the production of

GAS.

HEAT.

POWER.

COOKERY DEMONSTRATIONS & LECTURES.

Cookery demonstrations will be held on each day, when Exhibitors will have the opportunity of giving a public demonstration of the individual merits of the various **Gas Cooking Stoves.** Certain days will be allotted to each Exhibitor, and preference will be shown to individual firms.

BANDS.

Engagements will be made for the best **BANDS,** and the **Amusement of Visitors** will be considered in every way.

INVITATION TICKETS.

Exhibitors' Tickets will be issued at £10 per thousand. All tickets printed by individual Firms will have to be sent to the Management to be officially stamped.

PAYMENT.

All cheques must be paid in on or before the opening day of the Exhibition, and no Exhibit will be allowed to be removed if this regulation is not complied with. The charges will be 2s. to 3s. per square foot, according to position, corner stands 4s. per square foot.

NOTICE.

BRISTOL EXHIBITION.

The Rifle Drill Hall has been taken as the most commodious, for the month of November. Special terms will be offered to Exhibitors wishing to follow.

☞ **PARTICULARS FORWARDED ON APPLICATION.** ☜

CLASSIFICATION.

Application for Space to be made on the appended Form, which please fill in and return to

Mr. T. G. S. HERSEY, General Manager,
GAS INDUSTRIAL EXHIBITION, 39, Seething Lane, London.

DEPARTMENT A
Gas Cooking & Gas Heating

Section
1.—Gas Stoves closed.
2.—Gas Stoves open fires.
3.—Portable and other Gas Burners for Cooking, Boiling, and Warming.
4.—Cookery Demonstrations and Lectures.

DEPARTMENT B
Gas Lighting.

Section
1—Single and Multiple Grouping of ordinary batswing burners.
2—Street Lighting.
3—Sunlights, self-ventilating Lights for large buildings (such as Churches, Theatres, Concert Rooms, etc.).
4—Argand Burners.
5—Incandescent Burners.
6—Bunsen Burners for Incandescent Lighting.
7—Recuperative or Regenerative Gas Burners.
8—Gas Lamp Fittings.
9—Train and Vehicular Lighting.

DEPARTMENT C
Gas Engines.

Section
1—Portable Gas Engines.
2—Stationary Gas Engines.
3—Starting Devices.
4—Igniting Devices.
5—Autocar Motors.

DEPARTMENT D
Gas, Plant, etc.

Section
1—Gas Meters Wet, Gas Meters Dry, and Slot Gas Meters.
2—Materials and Apparatus employed in Gas Works Construction.
3—Refractory Materials, Retorts Horizontal and Inclined, Retort Settings, Fire Bricks, etc.
4—Coal Conveying and Coke Discharging Apparatus.
5—Designs of Plant for effecting labour economy.
6—Apparatus for Gas Purification.

DEPARTMENT E
Gas Plant Photos & Models

Section
1—Models and Plans illustrating apparatus for the production of Towns Gas in Retort Benches.
2—Models and Plans illustrating apparatus for the production of Water Gas.
3—Models and Plans illustrating the production of Oil Gas.
4—Other processes of Gas Production.

DEPARTMENT F

Section
1—By Product recovery Plant, Plans, etc.
2—Models of Plant for the recovery of Tar and Ammonia.
3—Samples of the Product.

DEPARTMENT G

Section
1—Gas Coal.
2—Cannel Coal.
3—Oil for Carburetting Water Gas [Process.
4—Oxide of Iron.
5—Lime.

DEPARTMENT H

Laboratory for Gas Analysis Light and Heat Testing equipped with Standard Photometers.

DEPARTMENT I
Acetylene Gas.

Section
1—Stationary Types of Generators.
2—Portable Generators.
3—Acetylene Lighting.
4—Special Methods of Testing Calcium Carbide to ensure safety, control of action, durability under exposure.
5—Acetylene Burners for Heating and Warming.
6—Acetylene Motors.

APPLICATION FORM FOR SPACE.

Subject to the Rules, Regulations, and Conditions which will be sent on application.

Gas Industrial & General Illuminating

EXHIBITION,

ST. JAMES' HALL, MANCHESTER,

September 10th, to September 29th, 1900.

Date _____ 1900.

Please reserve _____ space

Here state space required. _____

_____

for the purpose of exhibiting the Articles enumerated hereon during above period, and for which _____ agree to pay £ _____ as Rent, whether I occupy the space or not, in accordance with the conditions set forth in the Rules annexed.

A description of exhibits *must* be given below, and only those mentioned and eligible may be exhibited. A full description should also be enclosed for catalogue, the matter being written on one side of the paper only.

Here sign Name and address n full. _____

_____

GENERAL DESCRIPTION OF EXHIBIT.

Here state nature of exhibit. _____

_____

_____

_____

_____

_____

_____

_____

ADVERTISEMENT IN THE OFFICIAL CATALOGUE.

Date _____ 1900

Here state what Advertisement space in Official Catalogue (if any), required. *Please allot* _____ *page; for which* ____ *agree to pay the sum of* £ _____ *Terms; Whole page, ordinary, £6 6s., Half ditto, £3 10s.; Quarter Page, £2 10s.*

Here sign Name and Address in full. _____

_____

This Form should be filled in and returned to Mr. T. G. S. HERSEY, Manager, 39, Seething Lane. London, E.C.

LONDON: Printed by WALTER KING (at the Office of King, Sell & Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London—Tuesday, July 31st, 1900.

CONDENSERS, Washer-Scrubbers, "Cutler" patent CONDENSERS (14) 6 in. to 12 in. PIPE CONDENSERS, Patent WASHERS by "Livesey," "Holmes," and "Cockey," EXHAUSTERS up to 80,000 Cubic Feet per hour. ENGINES, BOILERS, &c. Several TOWER SCRUBBERS, PURIFIERS, METERS, GOVERNORS, PUMPS, TANKS, VALVES, &c.
J. FIRTH BLAKELEY AND CO., Gas Engineers, DEWSBURY.

BUXTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of Two STATION GOVERNORS (18-inch connections) to be erected at their Gas-Works.
The Plan of existing pipes may be seen, and other Information required given, on application to Mr. H. Barker, Gas Engineer, Town Hall, Buxton.
Sealed Tenders, endorsed "Governors," to be sent in addressed to the Chairman of the Gas Committee, Town Hall, Buxton, so as to reach him not later than Saturday, Aug. 11.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
July 23, 1900.

COUNTY BOROUGH OF HALIFAX.

THE Corporation of Halifax are pre- pared to receive TENDERS for the purchase of 3000 Tons of TAR to be taken from their Gas-Works betwixt the 1st of August and the 1st of March next.
Tenders to state the quantity the purchaser will take, and the price per Ton for same.
(*a*) Taken by Boat.
(*b*) Taken by Railway Tank Waggon.
Further Particulars may be obtained on application to Mr. Thomas Holgate, M.Inst.C.E., Engineer, Gas-Works, Halifax.
Tenders, endorsed "Tar," must be sent to the undersigned before Ten o'clock a.m. on Wednesday, Aug. 8, 1900.
The Corporation do not bind themselves to accept the highest or any Tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the purchase and removal of two old STEAM LANCASHIRE BOILERS each 18 feet 6 inches long by 5 feet 6 inches diameter.
They have lately been working at a pressure of 70 lbs. to the square inch, which has been certified by the Manchester Steam Users' Association, Mount Street, Manchester.
The same may be seen at the Gas-Works, Elton, Bury, upon application to Mr. H. Simmonds, Engineer and Manager.
Sealed Tenders, endorsed "Tender for Boilers," to be delivered to the undersigned on or before Monday, the 20th day of August.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, July 21, 1900.

BOROUGH OF DERBY.

DERBY CORPORATION WATER-WORKS.
CONSTRUCTION OF FILTER-BEDS.

THE Corporation of Derby are prepared to receive TENDERS for the construction of FILTER-BEDS at their Little Eaton Low-Level Water-Works, near Derby.
Drawings may be inspected, and copies of the Specification and Form of Tender may be obtained on payment of £2 2s., to be returned if a *bonâ-fide* Tender be made, on application at the Office of the Borough Surveyor, Babington Lane, Derby; and at the Office of Messrs. T. & C. Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after Tuesday, the 31st inst.
Tenders, on the prescribed form, must be delivered with the Specification (enclosed in a sealed envelope endorsed "Derby Corporation Water-Works, Contract No. 5, Tender for Filter-Beds," and addressed to the undersigned) at the Town Hall, Derby, at or before Ten o'clock in the forenoon of Monday, the 13th day of August next.
The lowest or any Tender will not necessarily be accepted.

H. F. GADSBY,
Town Clerk.

Town Hall, Derby,
July 23, 1900.

FELIXSTOWE GASLIGHT COMPANY, LIMITED.

ISSUE OF 900 FIVE PER CENT. CUMULATIVE PREFERENCE SHARES OF £5 EACH.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the issue of 900 NEW FIVE PER CENT. CUMULATIVE PREFERENCE SHARES of £5 each in the Capital of the Company.
Tenders must be delivered at the Company's Office, Hamilton Road, Felixstowe, not later than Twelve o'clock noon, on Friday, the 3rd day of August, 1900.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or at the Office of the Company's Solicitors, Messrs. Jennings and Haward, Felixstowe; or of the Company's Bankers, Messrs. Bacon, Cobbold, and Co., Ipswich and Felixstowe, or at any of their other Branches; or will be forwarded on application.

By order of the Board of Directors,
W. V. WATSON,
Secretary.

Hamilton Road, Felixstowe,
July, 1900.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Tuesday, the 14th day of August, at Six o'clock precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare a Dividend, and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 30th of July to the 14th of August, 1900, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: At the Works,
Bromley, Kent, July 26, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.
He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.
Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Now Ready. Price 6s.

LAW
OF
LONDON GAS COMPANIES

A SYNOPSIS of Public Acts affecting Gas Companies and of the Special Acts of the Metropolitan Companies, with Comments and a Short History: Including a Statement of the effects of the Conversion Acts of the GASLIGHT AND COKE COMPANY, and of the SOUTH METROPOLITAN COMPANY, and an Examination of the Capital and Loan Accounts to date of the three London Companies and of the Bills now before Parliament.

BY
T. J. BARNES,
OF THE MIDDLE TEMPLE *Barrister-at-Law.*

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.
Prices are Reduced.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HARDMAN & HOLDEN, LD.
ESTABLISHED 1820.
SULPHURIC ACID.
GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.
Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

LONDONDERRY GAS COALS
FROM THE
LONDONDERRY COLLIERIES,
COUNTY OF DURHAM.
Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

BOLDON GAS COALS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

As per Analysis by

Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 1/10 Stand. Sperm Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

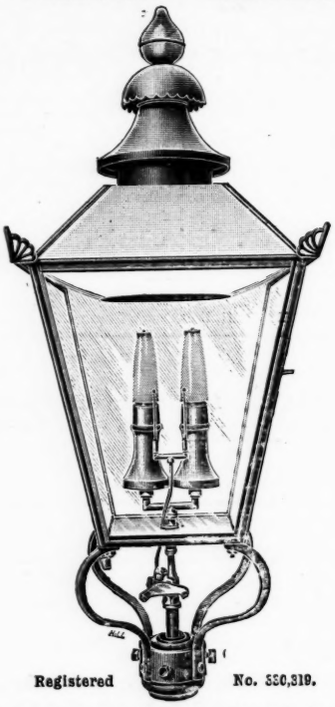
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

THE

"KILBURN" LANTERN.



Registered No. 330,319.

Fitted with Steel Enamelled White Reflector.

H. GREENE & SONS, LTD.

19, FARRINGDON ROAD, E.C.

Telephone: 1215 HOLBORN. Telegrams: "LUMINOSITY."

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·78 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

CONSUMERS OF

CARBURINE, BENZINE, NAPHTHA, OR PETROLEUM SPIRIT

Should communicate with

MESSRS. LANE & MACANDREW, 26, GT. ST. HELENS, LONDON,

BROKERS TO THE

"SHELL" TRANSPORT & TRADING COMPANY, LTD.,

who will very shortly supply the above from

BORNEO

IN LARGE QUANTITIES AT FAVOURABLE PRICES.

WELSBACH LIGHT.

THE

"WELSBACH SHADOWLESS"

CYLINDRICAL LANTERN.

EFFICIENT. ELEGANT. ECONOMICAL.

SHADOWLESS AND GENERATIVE.
COMPLETELY WINDPROOF.

BREAKAGE OF GLASS
REDUCED TO A MINIMUM.

Hinged top for convenience of Cleaning, &c., with door at bottom for lighting.

Perfect Diffusion.

Glass Cylinders Renewed at Small Cost.

WIDELY USED WITH BRILLIANT SUCCESS ON THE CONTINENT.

STRENGTH AND ELEGANCE COMBINED.

Galvanized Iron Top.
Glass Cylinder.
Cast-Iron Upper and Lower Rims.

A Perfect Lantern for thoroughly Economical and Efficient Incandescent Gas Lighting.

VERY MODERATE PRICE
HIGHEST POSSIBLE LIGHTING EFFECT.

STRONGLY RECOMMENDED.

Special Prices for Lanterns for 1, 2, and 3-Light Clusters and upwards on application to

The Welsbach Incandescent Gas-Light Co., LIMITED,

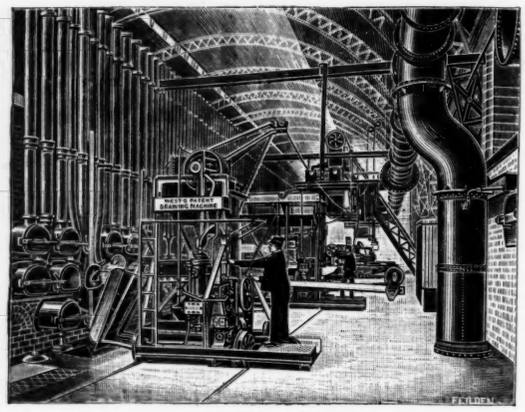
Public Lighting Department, York Street, Westminster, London, S.W.

WEST'S GAS IMPROVEMENT CO., LTD.,

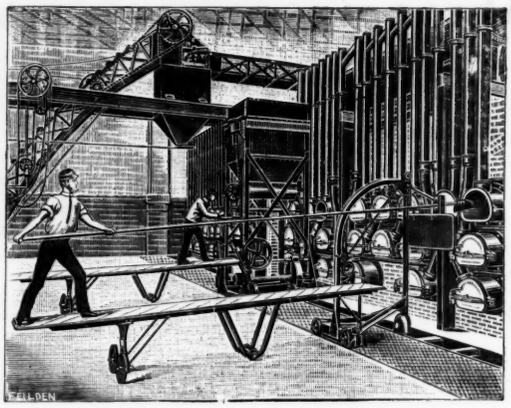
ALBION IRON-WORKS, MILES PLATTING,

And 104, QUEEN VICTORIA STREET, LONDON, E.C.

MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



West's Manual Charging and Drawing Machinery for Gas-Retorts.

WEST'S

PATENT

Silent Coke-Conveyor.

SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

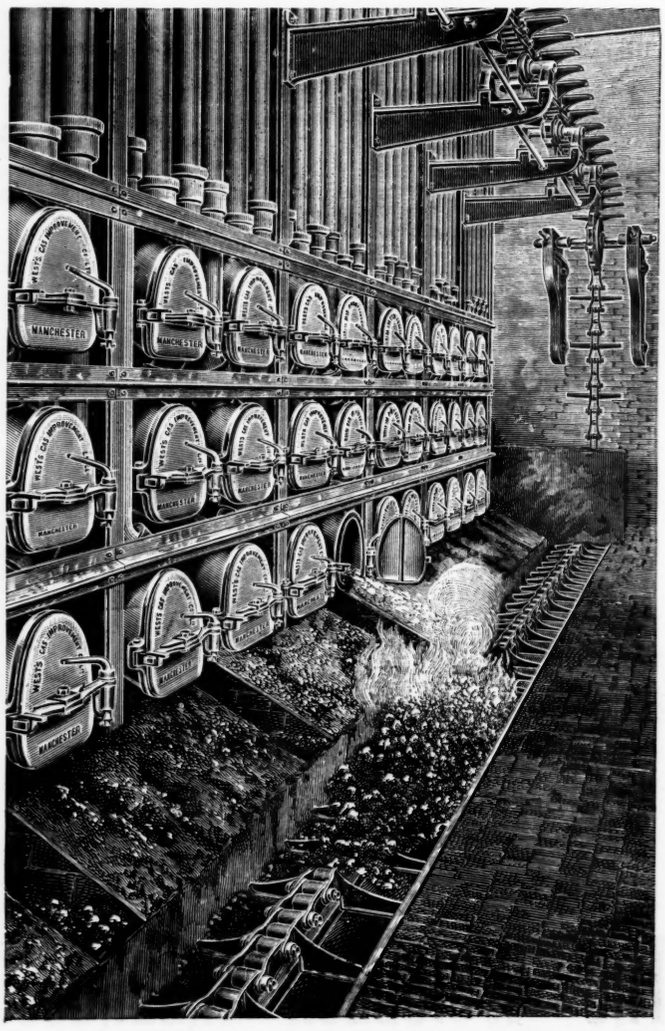
Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

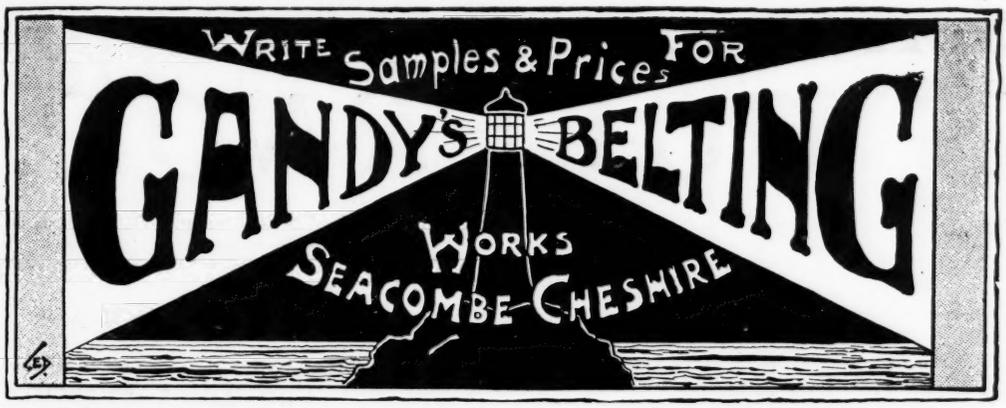
No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.



CONTRACTORS FOR

West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.



BRANCHES:
LONDON.
MANCHESTER.
GLASGOW.
BIRMINGHAM.
BRADFORD.
NEWCASTLE.
BRISTOL.

Sole Agents for
"DODGE"
Standard
Wood Split
PULLEYS.

AS USED BY THE LEADING GAS AND WATER COMPANIES.

THE
DENAYROUZE LIGHT SYNDICATE, LTD.

28, VICTORIA STREET, WESTMINSTER, S.W.

The Pioneers of Incandescent Burners without Chimneys.

THE "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming **3½** feet of Gas per Hour, having an efficiency of **25-Candle Power per Cubic Foot of Gas** consumed at ordinary pressure, is not only the **BEST** but **CHEAPEST** intensive **CHIMNEYLESS** Burner on the Market.

PRICE COMPLETE WITH MANTLE
4s. 9d.

All other Burners supplied by the Syndicate proportionately reduced, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

MOBBERLEY & PERRY
STOURBRIDGE.

Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c, &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
London Agents: Contractors for the erection of Retort-Benches complete.

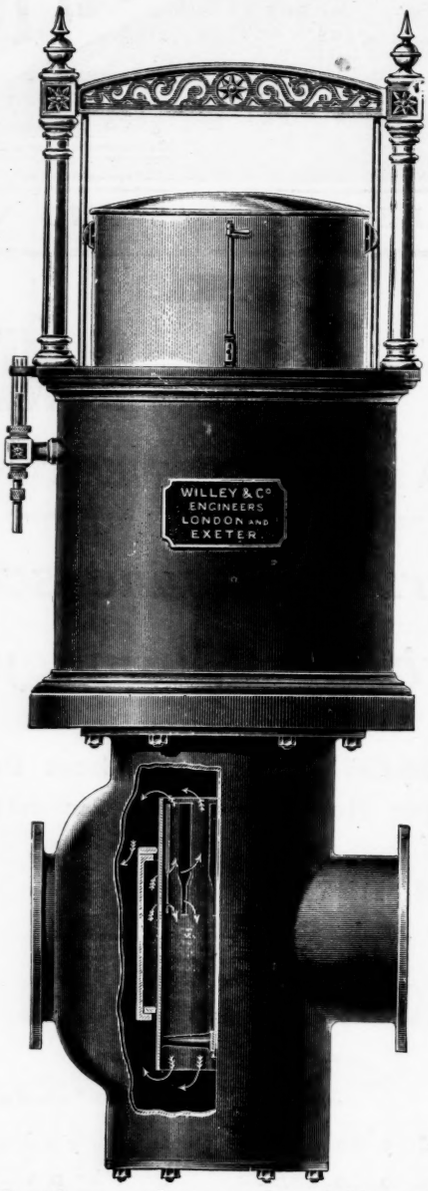
BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

IMPROVED PATENT
GAS GOVERNOR.

TESTIMONIAL FROM THE

PLYMOUTH & STONEHOUSE GASLIGHT & COKE CO.

"Our Engineer has reported to the Directors that the Patent Equilibrium Station Governor which you fixed here last year, replacing one of another make, is giving every satisfaction, and maintains an absolutely regular outlet pressure under most trying conditions. We consider the open-ended Cylindrical Valve perfect, and a great improvement on the usual complicated construction of Equilibrium Governors, which are generally only balanced in one position of their range."



The Inlet Pressure having absolutely no effect on the open-ended cylindrical Valve, the pressure is maintained constant at the outlet **UNDER ANY CHANGE OF PRESSURE OR DRAUGHT**, and dispenses with the usual complicated balancing arrangements.

Provided with a most **SIMPLE** and **CONVENIENT METHOD** of **WATER LOADING** and **WITHDRAWAL** without syphons or other complications, or with weights to adjust pressure as desired.

Manufacturers of Gasholders, Purifiers, and every description of Gas Plant of any capacity Station Meters, Wet and Dry Consumers' Meters, Prepayment Meters, Gas Apparatus and Gas Fittings. Also Bridges, Roofs, Columns, Girders, and Structural Iron and Steel Work of all kinds. All Sizes of Livesey Washers kept in Stock.

WILLEY & CO.,

ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

CHIEF OFFICES AND WORKS } **ST. THOMAS, EXETER.**

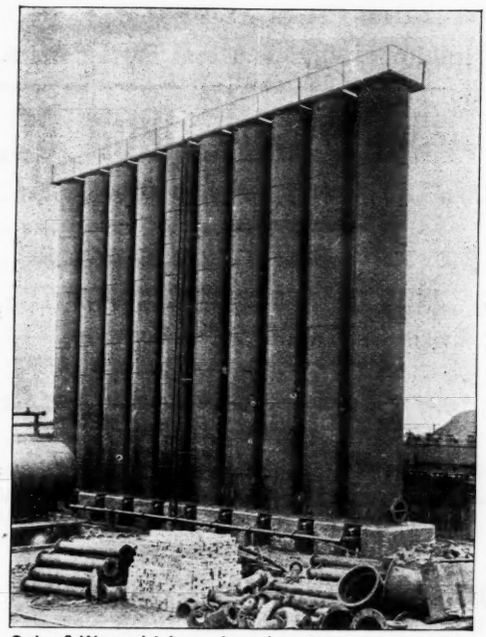
Telegrams: "WILLEY, EXETER."
Telephone: 132 and 263.

METER-WORKS—32a, Hertford Road, De Beauvoir Town, LONDON, N.; and James Street, EXETER.
OFFICES & DEPOTS—LONDON: 18, Adam Street, Adelphi; MANCHESTER: Victoria Buildings.
PLYMOUTH, DEVONPORT, SWANSEA, & NEWPORT.

ASHMORE, BENSON, PEASE, & CO., LTD.,

MANUFACTURERS OF

ALL PLANT FOR GAS-WORKS



Set of Wrought-Iron Annular Condensers with 24-inch Connections, 50 feet high, Outer Tubes 6 feet diameter, Inner Tubes, 5 feet diameter. (*From a Photograph.*)

INCLUDING—

Gasholders, Purifiers, Scrubbers,

Rotary Washers,

Hydraulic and Foul Mains,

Sulphate of Ammonia Plant, Valves,

Roofs, Retort Fittings, and

General Constructional Ironwork.

STOCKTON-ON-TEES.

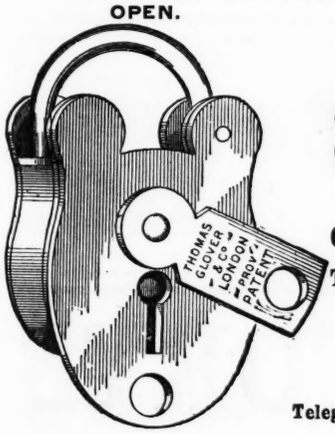
ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

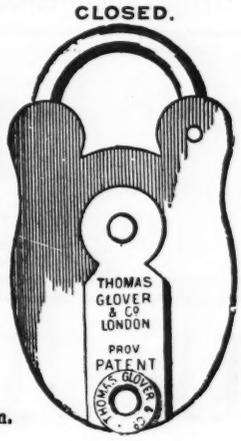
SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1098.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address:* "GOTHIC"

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 3896.

GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107.

TAPPING MACHINES
FOR
Drilling & Tapping
PIPE UNDER PRESSURE WITHOUT ANY ESCAPE OF GAS.

Combination Drills and Taps from ½ to 4 inches.

ADOPTED BY PRINCIPAL GAS COMPANIES THROUGHOUT THE UNITED STATES.

SEND FOR CATALOGUE.

Manufactured by GEORGE LIGHT, Dayton, OHIO, U.S.A.

INCLINED RETORT
BENCHES ERECTED COMPLETE.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS,

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, July 3, p. 55.]

JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.

INCLINED RETORTS
UP-TO-DATE FURNACES AND SETTINGS.

J. & H. ROBUS, 20, Bucklersbury, London. E.C.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N.
GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

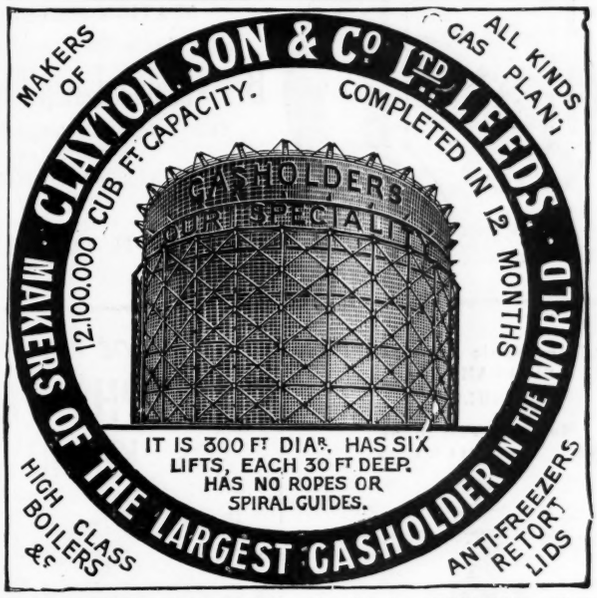
MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

BOWENS' Ltd. Successors
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "GAS, LEEDS." "ECLARAGE LONDON."

R. & J. DEMPSTER, LD., MANCHESTER.

Telegraphic Address:
"SCRUBBER, MANCHESTER."
National Telephone:
Nos. 54 and 2296.

IMPROVED
Water-Cooled Condensers

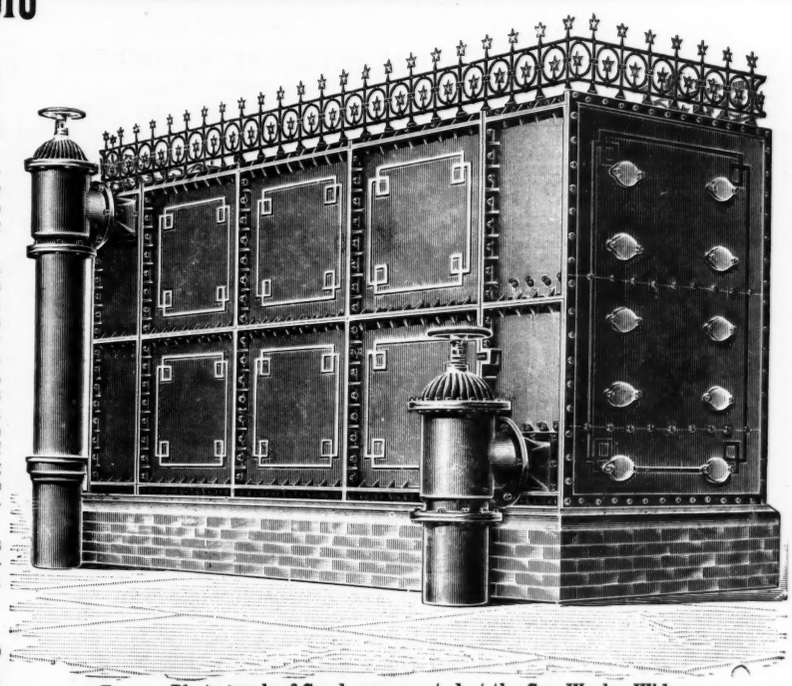
This water-cooled Gas Condenser is designed to work against the great variations of temperature between day and night, sunshine and shade, summer and winter, which are found in this and other countries.

Water being the cooling medium, the temperature of the gas can be kept under control better than with air; and the gas can be sent forward to the purifying plant at the proper temperature for efficient and economical purification.

The cold water enters at the bottom, and gradually rises to the top as the water absorbs heat, thus causing the warm gas to meet the warm water first, and to leave the Condenser in contact with water at any desired temperature by simply regulating the feed-water tap. The gas is thus **cooled progressively, uniformly, and effectually.** The simple construction of this Condenser affords a large cubical capacity, so that the gas remains in a considerable time, and secures all the advantage due to slow-speed condensation. Every part of the Condenser is easily accessible, and by removing the end plates the whole of the interior can be got at. It can be erected under cover, and protected from extremes of heat or cold.

R. & J. DEMPSTER, LTD., recommend this Condenser to be used as a Finishing Condenser, after the gas has already passed through the ordinary Annular or Air Condensers.

Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes.
Capacity 1,500,000 cubic feet per 24 hours.

HUTCHINSON BROS. & CO. LD.

GAS ENGINEERS, &c.,

MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.

STATION-METERS. LAMP-METERS.

Test Gasholders and General Gas Apparatus.

Brass Main & Lamp Taps. Unions, Ferrules, &c.

The "Falcon" Lamplighter's Torch. Service Cleansers.

SYPHON AND OTHER PUMPS.

WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.

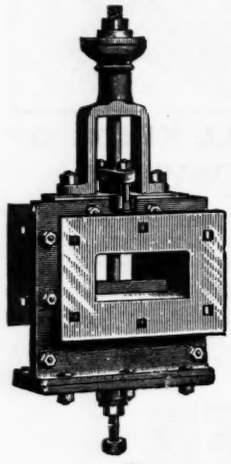
WET AND DRY METERS REPAIRED.

FALCON WORKS, BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY."

Telegraphic Address: "CLAPHAM BROS., KEIGHLEY."

National Telephone No: "KEIGHLEY 35."



"TRADE FOLLOWS THE FLAG"

CLAPHAM BROTHERS LTD

KEIGHLEY, YORKS. ESTABLISHED 1837

"SPECIALTIES"

London Representative:
THOMAS B. YOUNGER, C.E.
CHESTERFIELD HOUSE, 98, GREAT TOWER STREET.

Contractors to Her Majesty's Government.

WELLINGTON, NELSON, AND MARKET STREET WORKS.

LONDON OFFICE:

34, VICTORIA ST., WESTMINSTER, S.W.

TELEGRAPHIC ADDRESS: "DRAKESON, HALIFAX."

TELEPHONE No. 43 "HALIFAX EXCHANGE."

GAS ENGINEERS. CONTRACTORS. IRONFOUNDERS.

JONAS DRAKE & SON

SOLE AGENTS FOR

HISLOP'S

PATENT REGENERATIVE FURNACES

— FOR —

ENGLAND, WALES & ABROAD.

RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES. RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Stree in the City of London,—Tuesday, July 31, 1900.